AFRL-RH-WP-TR-2014-0134

Affect Response to Simulated Information Attack during Complex Task Performance

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December 2014

Interim Report

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REPORT DOCUMENTATION PAGE	*Form Approved* *OMB NO. 0704-0188*

1. REPORT DATE ***(DD-MM-YY)***	**2. REPORT TYPE**	**3. DATES COVERED** ***(From – To)***
02-12-2014	Interim	October 2011 – September 2014

4. TITLE AND SUBTITLE

Affect Response to Simulated Information Attack during Complex Task Performance

5a. CONTRACT NUMBER
IN_HOUSE

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
*Capt. Erik Armbrust; *Gina Thomas; *Krystal Thomas; *Lt. Monika Eckold
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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER
H0AE (2311RC11)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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^Air Force Institute of Technology, 2950 Hobson Way, WPAFB, OH, 45433-7765

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Air Force Materiel Command, Air Force Research Laboratory, 711th Human Performance Wing, Human Effectiveness Directorate, Warfighter Interface Division, Wright-Patterson AFB OH 45433

10. SPONSORING/MONITORING AGENCY ACRONYM(S)
711th HPW/RHCPA

11. SPONSORING/MONITORING AGENCY REPORT NUMBER(S)
AFRL-RH-WP-TR-2014-0134

12. DISTRIBUTION/AVAILABILITY STATEMENT
Distribution A: Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES
88 ABW Cleared 12/22/2014; 88ABW-2014-6038; Report contains color.

14. ABSTRACT (Maximum 200 words)
An experimental facility was developed and an experiment performed to evaluate the following 4 research questions: 1) To what extent does performance of a complex task differ when affected by manipulation of underlying information elements and can an affective computing technique mitigate these effects; 2) To what extent are an individual's traits associated with differing abilities across individuals to "fight through" an informational attack; 3) Is an individual's cognitive state associated with differing levels of coping with additional demands created by informational attack; and 4) Can an individual's physiological state accurately reflect differences in emotional state caused by informational attack?
The experimental facility, the Cyber Affect Laboratory (CAL), supported data collection for a single participant and a remoted research to monitor the participant and administer written material for subjective reporting when needed. The CAL integrated behavioral and physiological measurement equipment as well as hosting a multiple task battery, the AF-MATB, with visual displays and convention computer controls. AF-MATB was modified to simulate several persistent information attacks during which the participant was required to continue to operate the multiple tasks. In addition, affective computing techniques were utilized to further understand how induced affect could be used to mitigate the effects of the informational attacks.

15. SUBJECT TERMS
Affective Computing, crew systems, Human Systems Integration, Human-computer Interaction, cyberspace, information warfare

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**	SAR	134	(Monitor) Krystal Thomas
Unclassified	Unclassified	Unclassified			**19b. TELEPHONE NUMBER** *(Include Area Code)*

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18

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ACKNOWLEDGEMENTS

The authors wish to thank Mr. Johnathan Jackson (Sumaria) and Ms. Cynthia Schindler (Sumaria) for their considerable efforts in the initiation of this study. Funding for this work was provided by the Air Force Office of Scientific Research.

1.0 SUMMARY

1.1 Mission Assurance

A key scientific challenge for the Air Force is the discovery of enhanced methods to reduce our vulnerability to attack in, and through, the cyberspace domain. Our adversaries are operating within our information networks and the resources required to mount offensive actions in, and through, cyberspace remain significantly lower than the resources required to defend against those same actions. The philosophy behind our defense of cyberspace has moved from *information* assurance to *mission* assurance. The ability of warfighters to build and maintain situational awareness is a key design characteristic of and training objective for modern weapon systems and is essential for mission assurance. Attacks in and through cyberspace, when targeted effectively, can significantly degrade the situational awareness of warfighters.

Normally, specific knowledge regarding targeted information resources is derived from post-attack forensic malware analyses and intelligence reports. These are typically time-intensive efforts leaving hours, days, or even weeks between the detection of a cyberspace-based attack and the knowledge of the information resource upon which the malware operated. During these periods of uncertainty, individual warfighters and war-fighting teams who are dependent on information flowing directly or indirectly from the malware-targeted resources are vulnerable to breakdowns in situational awareness resulting in error-prone and delayed decision-making. This could be a deliberate D5 effect (deceive, deny, disrupt, degrade and destroy) or non-deliberate attack by hostile actors, either of which act to degrade or disrupt friendly operations.

This research effort hopes to increase the capability to maintain mission assurance during attacks in and through cyberspace by augmenting the warfighter's ability to operate with uncertain information quality which could be actively influenced by malicious actors. Because existing research in this area is so limited, this study will provide insight into potential limitations of situational awareness during cyber attacks, providing a foundation for understanding the impact of affect on critical task completion.

1.2 Defensive/Offensive Performance Augmentation

The main goal of this research is to benefit our nation's defensive ability and offensive targeting systems by affording us first glimpses at predicting what specific cyber behaviors or patterns of behaviors may trigger productive or destructive affect, and what cognitive or personality traits are predictive of better or worse performance under varied affective influence in these contested environments. Defensive augmentation of the warfighter force could be accomplished through additional training targeting affective vulnerabilities discovered from these results, and a better trait/cognitive screening or vectoring process for filling positions critical to mission-assurance. Future applications of this knowledge could aid development of systems that unobtrusively detect affect states, automatically change the interface to best suit that state, vector outside resources, add personnel, or auto-engage strategies that would enable performance augmentation on a system-wide scale. Offensive targeting systems would also be informed by this research, giving insight into what affect states are elicited by certain information attacks, and how those affect states and attacks interact to degrade human performance. Further, it is possible that certain traits are related to a subject's tendency to experience deleterious affect states which could be used as offensive targeting criteria.

1.3 Cyber Affect Laboratory

The Air Force Office of Scientific Research awarded funding to Applied Neuroscience Branch, 711th Human Performance Wing (711HPW/RHCP) to begin research focused on defending the situational awareness and decision-making of individuals operating under information attack through cyberspace. The research program was separated into three distinct, yet interrelated pathways or phases: 1) examining how situational awareness, affect, and trait characteristics interact with human performance during simulated cyberspace attacks and capturing that understanding in a model; 2) determining how effectively reactive affective computing techniques may be utilized to manipulate affect during task performance, based on predictions derived from that model; and 3) understanding how emotion, as manipulated using reactive affective computing techniques, may be used to mitigate situational awareness deficits due to cyberspace-based attacks. This is the first study in the initial phase of general research examining how situational awareness, affect, and trait characteristics interact with human performance during cyberspace attacks in the physical and information dimensions. As a part of this research program, a new facility, the Cyber Affect Laboratory was developed.

2.0 INTRODUCTION

2.1 Purpose

The purpose of this study was to systematically examine emotional responses to information manipulation of key task parameters during task performance. In essence, to determine an individual's ability to "fight through" an informational attack, or in other words, to determine an individual's resiliency. Operator state was manipulated using emotional stimulation portrayed through the presentation of video segments. The effect of emotions on situational awareness and decision-making (as reflected by a performance score) under simulated cyber attack was analyzed. By examining participants' responses to the simulated cyber-based informational attacks, an attempted to determine to what extent an individual's traits, such as personality, cognitive ability, and emotional responsiveness were related to one's vulnerability, as reflected by reduced task performance and the ability to adapt and properly respond to the attacks.

2.1.1 Research Questions

> To what extent does performance of a complex task differ when affected by manipulation of underlying information elements and can an affective computing technique mitigate these effects?
>
> To what extent are an individual's traits associated with differing abilities across individuals to "fight through" an informational attack?

Is an individual’s cognitive state associated with differing levels of coping with additional demands created by informational attack?

Can an individual’s physiological state accurately reflect differences in emotional state caused by informational attack?

2.2 Affect

Affect has been defined in the literature as a general mental state that involves evaluative feelings, including the feelings of internal pleasantness and how much the person likes or dislikes a situation (Parkinson, Totterdell, Brinner, & Reynolds, 1996). The term ‘affect’ entails two distinct constructs, emotion and mood. Emotion is the instantaneous affect felt toward or about an object or immediate circumstance, which is temporary and transient in nature (Davidson, On emotion, mood and related affective constructs, 1994; Gray & Watson, 2001; Watson & Clark, 1994). Mood is the more durable affect state which lasts over a slightly longer period and is not directed toward or resulting from any single object or circumstance (Tellegen, 1985; Watson, 2000; Watson & Clark, 1994). There are also two larger categories of affect: Trait and State. State affect includes the short-lived emotions and moods, while Trait affect is the general tendency to experience certain affect states more than others over a very long period (Tellegen, 1985; Watson, 2000). Figure 1 illustrates the overlapping nature of affect dimensions.

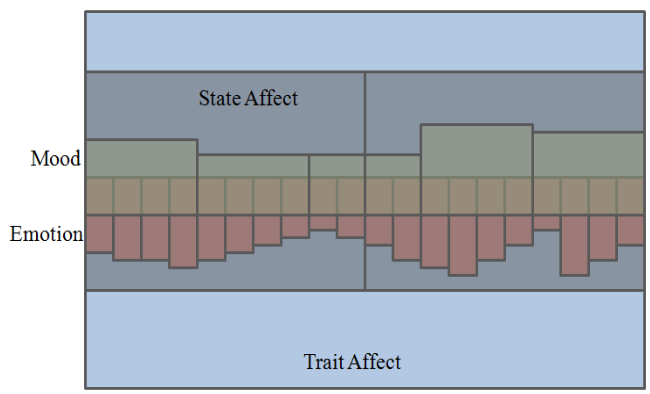


Figure 1. Overlapping affect

2.3 Affect-Performance-Situation Awareness

Research on the effects of emotion on performance during simulated cyber attack is sparse at best. Existing research does seem to indicate that negative affect combined with high arousal increases the probability of performance or judgment error (for example, see (Kleider, Parrott, & King, 2010). Some research (Abele, Silvia, & Zöller-Utz, 2005; Gilbert & Christopher, 2010) focuses the relationships between affect and attention in terms of inward vs. outward locus of attention. In general, negative affect seems to have a tendency to focus attention inward. Hirshfield (2009) has studied how higher-level mental constructs, such as workload, may be affected by levels of valence and arousal in six emotional categories of happiness, sadness, fear, anger, surprise and disgust by using the neurologic measures of electroencephalography and near infrared spectroscopy and has begun to utilize this same methodology on the mental constructs of trust and suspicion.

2.4 AF-MATB

The Multi-Attribute Task Battery (MATB) is a software application developed by Langley Research Center at NASA in 1992. Used in an array of international studies since its creation, MATB has become a recognized tool in psychological and psycho-physiological research. Recently, the Air Force Research Laboratory has modified the original software in order to increase compatibility on newer operating systems while keeping its original design intact, renaming the application AF_MATB. Although AF_MATB offers many useful features, for this experiment, AF_MATB has been modified once again in order to allow for the simulation of cyberspace-based attacks while the user operates the software. Unless specified otherwise, AF_MATB will hereafter refer to this most recent version with cyber attack simulation.

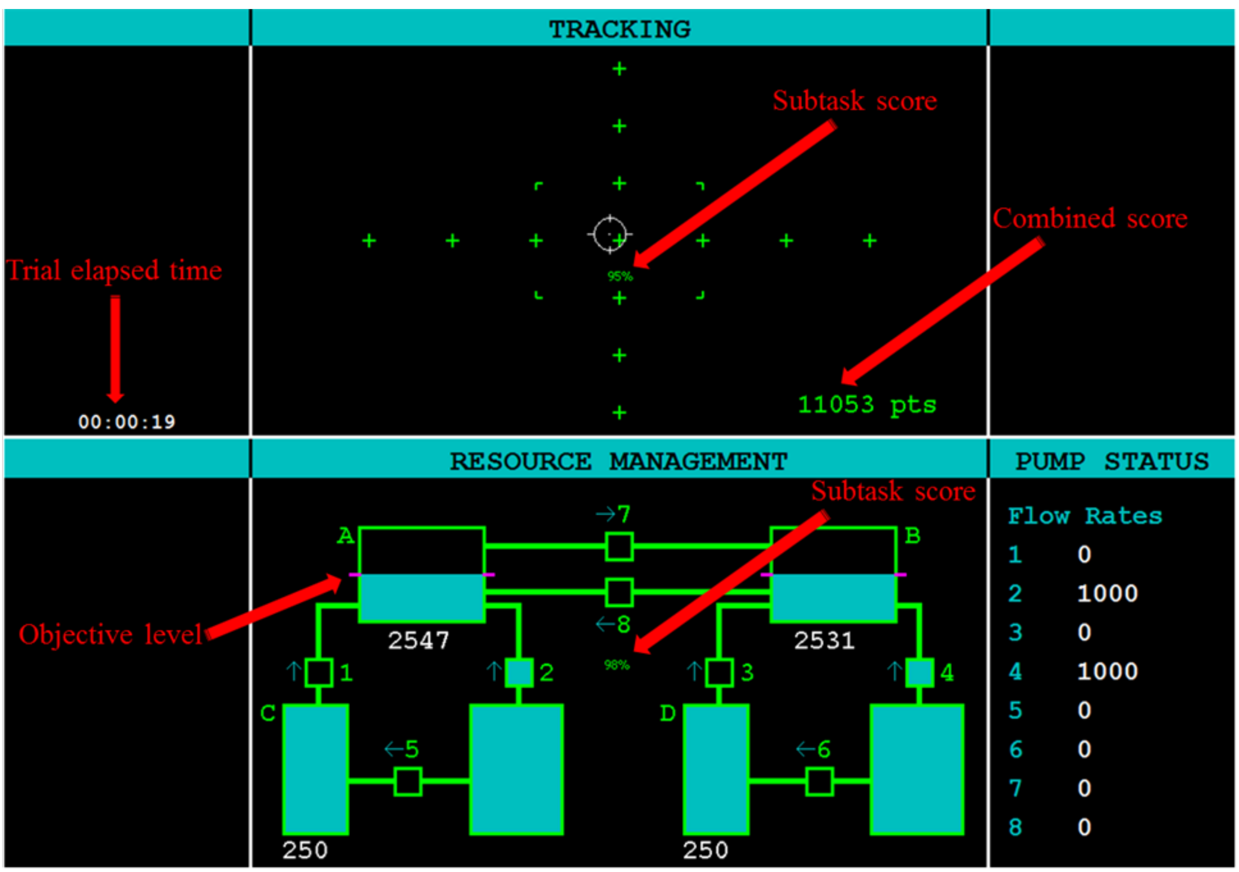


Figure 2. AF_MATB

Visually, AF_MATB consisted of three display frames, which together represent two subtasks: Tracking and Resource Management. The top display frame represents the Tracking subtask. The objective of this task was to hold a reticule as closely to a center crosshair as possible.

Throughout the duration of the trial, the reticule randomly tends to one of eight directions (north, north-west, west, etc.) changing tendency often. With the manipulation of a joystick, the user could overcome and correct this movement, allowing the user to bring the reticule back to the center.

The bottom display frame represents the Resource Management subtask. The objective of this task was to maintain the volumes of two fuel tanks (Tank A and Tank B) as closely to a predefined objective level as possible (2500). Fuel is consumed regularly throughout the duration of a trial, decreasing the volume of each tank. To counteract this, fuel must be pumped into Tanks A and B indirectly from two unlabeled bottomless tanks. The user operates a set of eight pumps with the keyboard in order to balance the fuel being consumed with the fuel being pumped into Tanks A and B. Each pump constantly transfers fuel in the direction denoted by its arrow and at the rate displayed next to its corresponding number in the Pump Status frame (bottom right frame). When a pump is ON, a fixed, predefined flow rate is displayed and when off it becomes zero. When a pump fills a tank completely, the pump automatically disengages and must be re-engaged as necessary. Under normal operating conditions, a colored (green, yellow, or red) pump denotes ON and black denotes OFF (see below, Cyber Attack Simulation). A pump can be switched between ON and OFF by pressing its corresponding number on the keyboard or by clicking on it in the AF_MATB window. Pumps 2, 4, 5, and 6 are relatively slow pumps, while 1 & 3 operate extremely quickly. The fuel tank size of C & D was intended to be small so that they would quickly empty when pumps 1 & 3 were engaged. This was done in order to focus more attention on the bottom frame in an attempt to equally split the participant's attention between tracking and resource management. Simply turning on pumps 2 & 4 would not be sufficient to maintain the objective 2500 level. Use of pumps 1, 3, 5, and 6 would be continually required to maintain performance. Flow rates were equal for 2 & 4, and for 5 & 6. The optimal strategy explained to each participant was to permanently engage 2 & 4, then briefly 1 & 3, then refilling tanks C & D via pumps 5 & 6, then repeat process repeatedly to maintain levels as necessary.

During each trial, AF_MATB maintains a real-time user performance score for each subtask (frame) as well as a total user performance score, which is a calculated average of the two subtask scores. Each score is a percentage, with "100%" representing perfect performance and lower percentages representing correspondingly worse performance. The subtask percentage scores are displayed in the middle of each subtask frame. The overall performance score is displayed on the bottom right side of the top frame, and normally ranges +/- 100,000 points in a one-minute task. In addition to the displayed percentages, task performance meta-information is shown through the color of the displays itself. Each subtask frame changes color independent of the other when a performance threshold is crossed. The three thresholds are 0%—50% (red), 51%—75% (yellow), and 76%—100% (green).

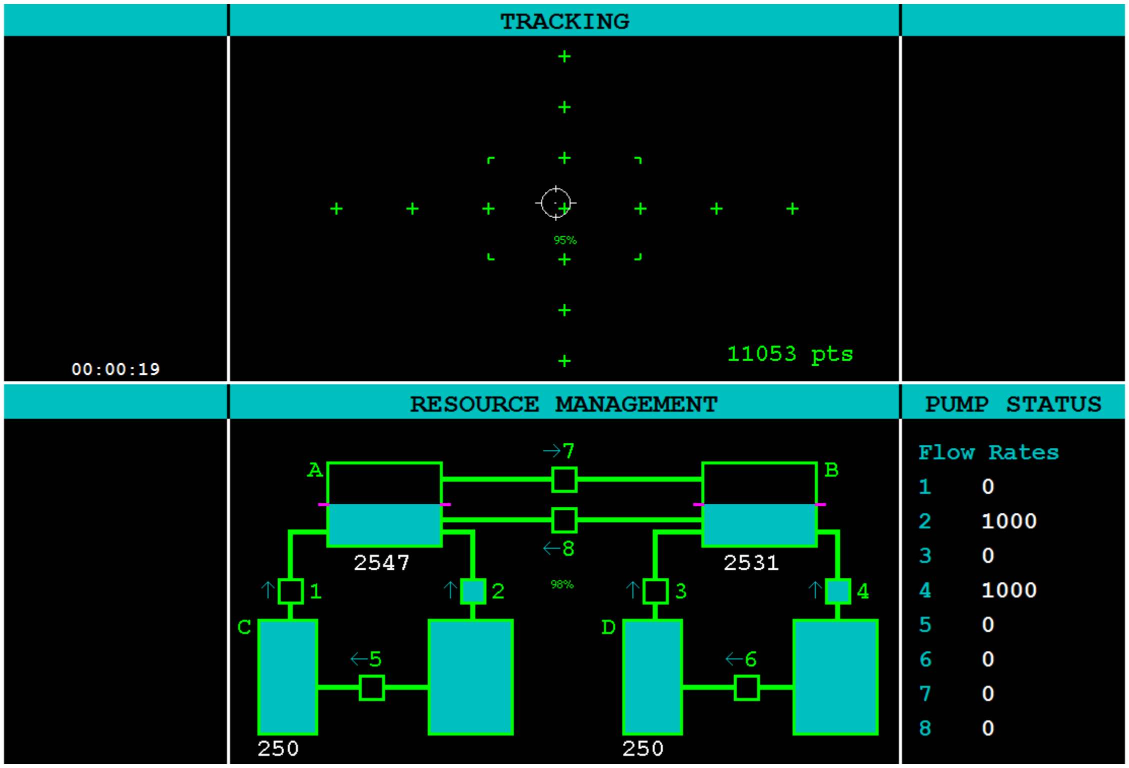


Figure 3. User performing well in both tasks

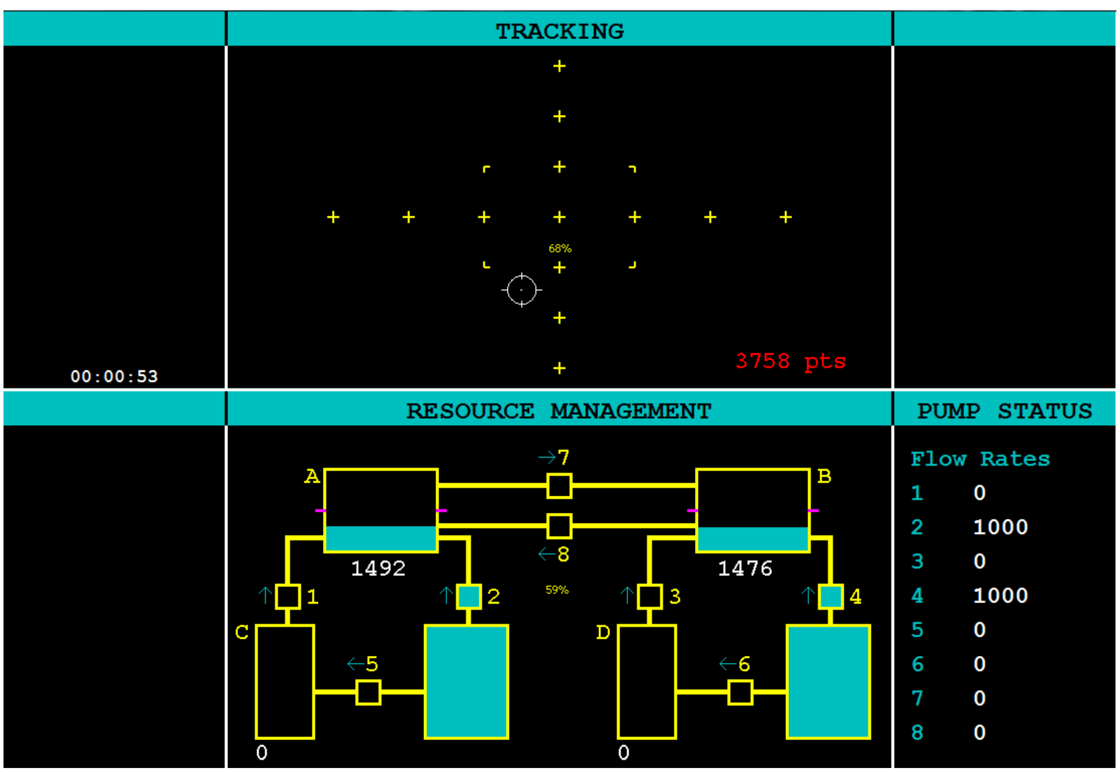


Figure 4. User performing moderately in both tasks

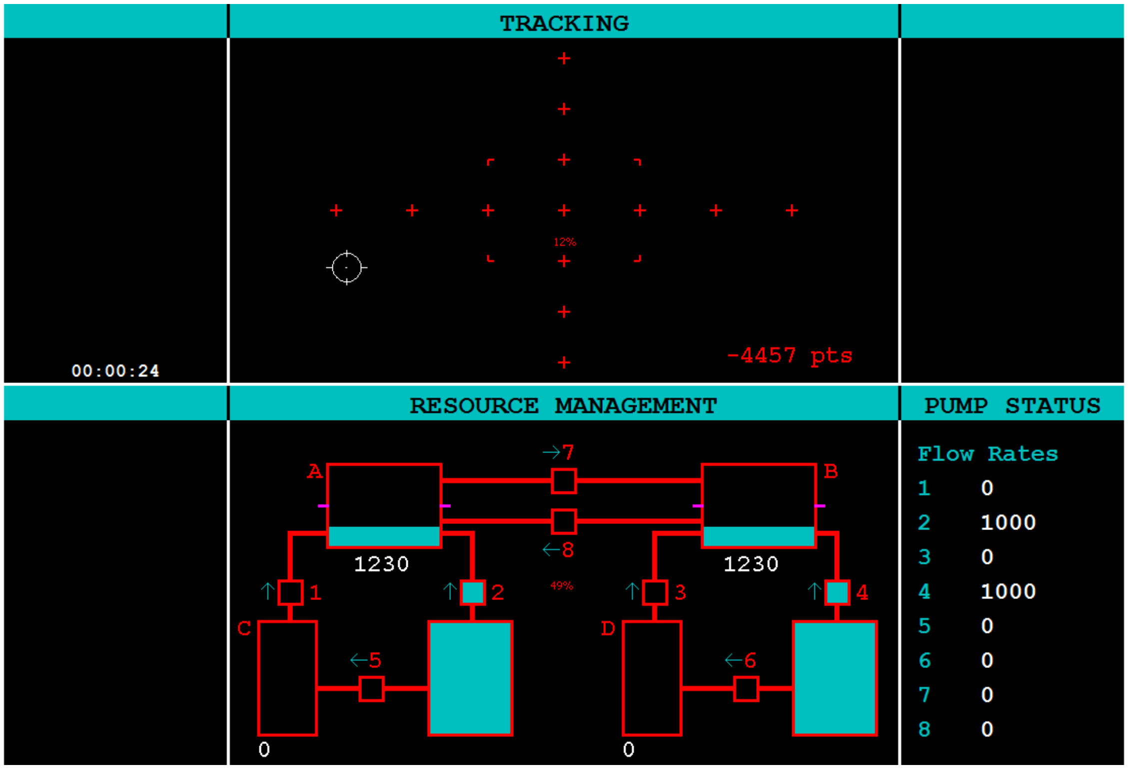


Figure 5. User performing poorly in both tasks

2.5 Cyber Attack Simulation

Four simulated cyber attack conditions were used during this experiment. The four conditions were 1) no attack is occurring (N), 2) an attack on the tracking task is occurring (T), 3) an attack on the resource management task is occurring (F), and 4) an attack on the display of total points is occurring (S).

Attack condition 2 (T) – Simulated attack on the tracking task

During this condition, the response of the joystick was altered such that the reticule became significantly less sensitive to joystick input than in attack condition 1 where no attack occurred, and the Y-axis input was inverted. Attack condition 2 began after 10 seconds trial duration and will cause the tracking task to become much more difficult to operate. It was anticipated that the participant would need to allocate more cognitive resources to the tracking task.

Attack condition 3 (F) – Simulated attack on the resource management task

During this condition, the ON/OFF colors of pumps 1, 5, and 7 were inverted such that after 10 seconds trial duration they would appear black when ON and normal colored when OFF, as opposed to appearing black when OFF and normal colored when ON as they do during attack condition 1.

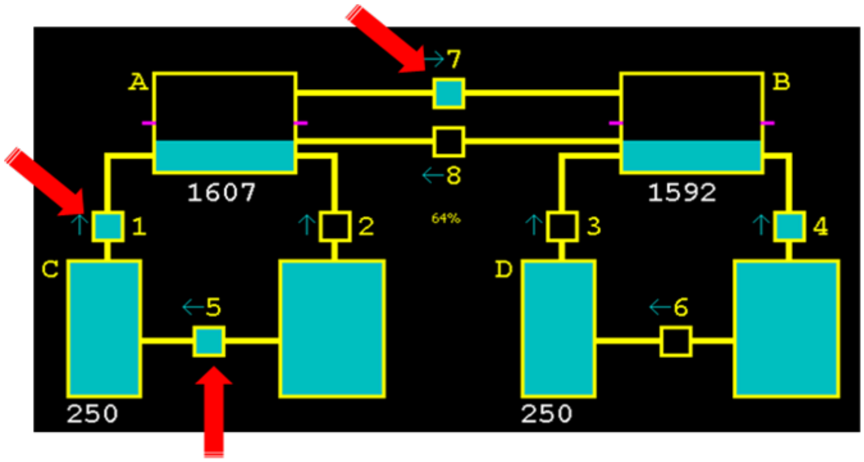


Figure 6. Pump attack condition, inverting light function on pumps 1, 5, and 7

Attack condition 4 (S) – Simulated attack on the display of total points

During this condition, the display of total points did not increase predictably in correlation with the task performance percentages shown on the tracking and resource management display windows. Essentially, the reported score to the participant was 80% of the true value being scored, leading the participant to believe they were not performing as well as previously, assuming some participants paid attention to the score differences. This effect was predicted to be greater during the second session of trials (9-16) when participants had more experience and remembered what a ‘normal’ score was during the first session. This attack was in opposition to the operation of the total point display during attack condition 1. During attack condition 1, the display of total points increased at a rate that correlated with the percentage of task performance shown on the tracking task and the resource management windows.

2.6 Measures

NASA TLX

The NASA Task Load Index (TLX), a standard workload assessment (~ less than 2 minutes in duration), was administered to participants after the task was completed. The NASA-TLX (Hart & Staveland, 1988) assesses mental demands, physical demands, temporal demands, a user’s performance, effort, and frustration (APPENDIX E).

PANAS-X

The PANAS-X, or Positive and Negative Affect Scale – Expanded is a 60 question measure of emotion and mood in participants (APPENDIX F). The scale measures General Affect (Negative & Positive), and 11 discrete emotions, Fear, Hostility, Guilt, Sadness, Joviality, Self-Assurance, Attentiveness, Shyness, Fatigue, Serenity, and Surprise (Watson & Clark, 1999). The time reference for self-report can be adjusted based on the research objective to measure either Trait (generally feel) or State (feel right now) affect. For this research, “during the last session” was used as the time frame for self-report, and only general positive and negative affect assessed. Scores for the general categories range from 10-50.

Affect Grid

The Affect Grid (APPENDIX G) is designed to be a quick measure of single-instance affect along two dimensions of affect that have been shown to account for almost all variance in subjective self-reported measures of affect (Russell, Weiss, & Mendelsohn, 1989; Russell & Mehrabian, 1977). Therefore, the grid is set up along two axes of arousal and valence. Arousal is defined as *engagement* versus *disengagement*, while valence is defined as *pleasantness* versus *unpleasantness* (Watson & Tellegen, 1985). One of the main reasons for using an index such as this is that it can measure emotion based on a circular continuum or circumplex, when other measures can only sum responses into discrete affect categories, which are often highly correlated with one another and not preferable for continuous scoring methods, as noted by (Russell, Weiss, & Mendelsohn, 1989). Below is an example Affect Grid circumplex. This measure is scored from 1 to 8 on each axis/dimension, with (1,1) being the bottom left block, (9,9) being the top right, and (5,5) being the neutral position.

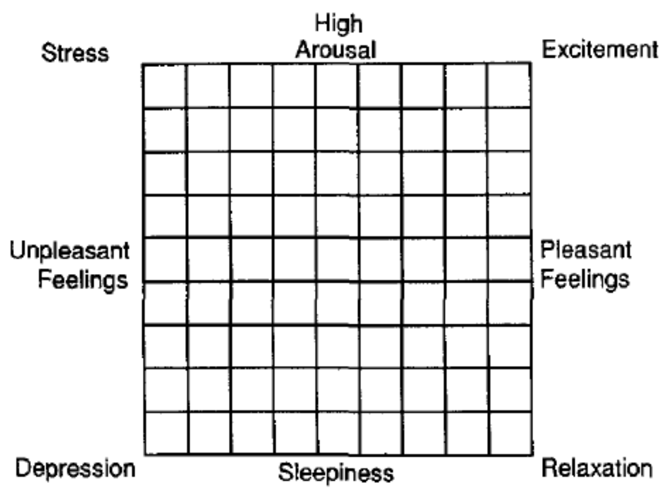


Figure 1. The Affect Grid. (The subject first reads the general instructions [given in the Appendix] and then is given specific instructions, such as “Please rate how you are feeling right now.” The subject places one checkmark somewhere in the grid. The pleasure–displeasure (P) score is taken as the number of the square checked, with squares numbered along the horizontal dimension, counting 1 to 9 starting at the left. The arousal–sleepiness (A) score is taken as the number of the square checked, with squares numbered along the vertical dimension, counting 1 to 9 starting at the bottom.)

Figure 7. Affect Grid (Russell, Weiss, & Mendelsohn, 1989)

Trait Measures

The five-factor model of personality has developed over decades of research, and is the most widely accepted and utilized personality model among researchers. The “Big Five” factors of personality are the only factors of personality that consistently emerge in replicated factor-analyses (Saucier, 1997), which include Extraversion, Openness, Neuroticism, Agreeableness, and Conscientiousness. The model was developed and intended to be a taxonomy of personality traits, whose central goal was the "definition of overarching domains within which large numbers of specific instances can be understood in a simplified way" (John, Naumann, & Soto, 2008). Additionally, a taxonomy such as the Big Five allows researchers to "study specified domains of related personality characteristics, rather than examining separately the thousands of particular attributes that make human beings individual and unique" (John, Naumann, & Soto, 2008). It is most useful in modern research studies due to the model's widespread use and establishes a common framework within which to operate and compare results. While the Big Five traits were derived from decades of "analyses of the natural-language terms people use to describe themselves and others" (John, Naumann, & Soto, 2008), this number should not imply that there are only five discrete personality traits making up a person. These factors are merely the broad, "Big" dimensions of a person which subsume many of the lesser "facet" traits that more fully differentiate the unique nature of each human mind.

There are a few different widely used measures of the Big Five-Factor Markers, to include the BFI (Big Five Inventory), NEO-FFI/PI-R (Neuroticism, Extraversion, Openness Five-Factor Inventory/Personality Inventory-Revised), and the TDA (Trait Descriptive Adjectives). These inventories show high corrected convergent validity with one another (mean r= .75; (John, Naumann, & Soto, 2008), therefore the specific Big-Five test used is not a major issue. The BFI and NEO-FFI use short phrases known to be "prototypical markers" of the five-factor personality model (John, 1989; John, 1990) while the TDA uses only simple adjectives that were selected as uniquely defining each of the five-factors which can be confusing or ambiguous to the participant (Goldberg, 1992; Goldberg, et al., 2006; John, Naumann, & Soto, 2008). In addition, multiple International Personality Item Pool (IPIP; 50 or 100 question options) inventories have been developed to be highly correlated with each of the previously cited five-factor structure measures (Goldberg, et al., 2006). While the NEO-PI-R inventory (250-question) seems to be the most popular test among researchers, for the purposes of this research and desire for testing expediency (that still maintains equally high internal validity), a 100-question IPIP questionnaire based on Goldberg's (1992) perspective on the five-factor structure was utilized (APPENDIX D).

Emotional Regulation Ability

The STEM, or Situational Test of Emotion Management was developed by MacCann and Roberts (2008) as a simple, quick and most importantly, freely-available measure of emotional management ability in participants (APPENDIX C). The test is made up of 44 multiple-choice, scenario-based questions where the participant chooses "among the four response options for the most effective action for the person experiencing that situation" (Austin, 2010). It is hypothesized that emotional management/regulation ability allows a participant to better process affective environmental content, allowing the participant to better perform basic tasks during affective events.

Due to the STEM being uncorrelated with standard intelligence tests (Austin, 2010), it may account for non-intelligence based variance in performance scores on the basic AF-MATB task.

This is in contrast with other emotional intelligence measures such as a component of the Mayer-Salovey-Caruso-Emotional-Intelligence Test (MSCEIT), which showed correlations between 'Understanding Emotions,' Vocabulary ($r=.23$, $p < .05$), and Series ($r=.25$, $p < .01$) intelligence of the 'Gf/Gc quickie test battery' (Austin, 2010). These results seem to be in agreement with the notion that "abstract reasoning intelligence" accounts for performance in Understanding Emotions as it is the "most cognitively saturated" component of emotional intelligence (Austin, 2010; Mayer, Salovey, Caruso, & Sitarenios, 2001). This component seemed irrelevant to the current research, as it is unlikely that understanding emotions would account for any variance in performance of this task above and beyond a shorter intelligence test like the Gf/Gc battery. While the MSCEIT is the most used EI measure (MacCann & Roberts, 2008), it was unnecessary to use in this research. Additionally, the STEM has been shown to be significantly correlated with the MSCEIT Using ($r= .25$, $p < .05$), Understanding ($r=.40$, $p < .01$), and Managing ($r=.30$, $p < .001$) branches (Austin, 2010). There are two weighting methods to score the STEM, by the mean expert rating for each choice or by the proportion of experts selecting that choice. The participants score would then be a measure of agreement with expert ratings or proportions on each question.

Cognitive Ability

It was hypothesized that there would be a positive correlation between participants of average performance of the AF_MATB task conditions and choice/decision reaction time, abstract reasoning/planning ability, and the ability to quickly change cognitive strategies in light of changing environmental operating rules (contingencies). The following cognitive tests were administered to measure these areas of interest, taking approximately 30 minutes. Examples can be found in APPENDIX H.

CANTAB Choice Reaction Time (CRT)

This test measured the speed of response to a single unpredictable stimulus, taking about six minutes in duration. The participant was presented either a left or right pointing arrow at random, and asked to press the corresponding left or right button on the press-pad as quickly as possible.

CANTAB Stockings of Cambridge (SOC)

This test assessed spatial planning and motor control, taking approximately 10 minutes. The participant rearranged balls in a virtual stocking in order to reflect a given pattern, with increasing number of move difficulty (up to five moves).

CANTAB Intra/Extra Dimensional Set Shift (IED)

This test assessed rule acquisition and attentional set shifting abilities, taking seven minutes in duration.

Physiological Sensors

A fair amount of research has shown that basic emotions or affect states can be deduced from a wide array of physiological signals (Chang, Tsai, Wang, & Chung, 2009; Haag, Gorozny, Schaich, & Williams, 2004; Kim & Andrè, 2008; Kim, Bang, & Kim, 2004; Picard, Vyzas, & Healey, 2001; Villon & Lisetti, 2007; Wagner, Kim, & Andre, 2005).

Electromyography (EMG) is one such physiological signal used to measure muscle activity. Muscle action can be recorded to study the human body's reaction to a stimulus (Stern et al, 2001). Fujimura et al (2010), Sato et al. (2008), and Chang et al (2009), with research focused on emotion and facial expression movement, found that positive stimuli increased the activity in the zygomaticus major muscle while negative stimuli increased the activity in the corrugator's supercilious muscle.

Skin conductance (SC) is a measure of the state of one's interaction with their environment and is usually measured in places on the body where eccrine sweat glands have the highest concentration (Stern et al, 2001). Skin conductance is a term that is interchangeable with electro dermal activity (EDA), skin conductance level (SCL), skin potential level (SPL), and galvanic skin response (GSR) amongst the literature. Bechara et al (2000) find that electro dermal activity is heightened when a reward (positive stimulus) and punishment (negative stimulus) are presented to individuals. Skin conductance levels are heightened when viewing pleasant and unpleasant pictures versus neutral images (Bradley, Codispoti, Cuthbert, & Lang, 2001). Overall, to evoke a measureable skin conductance response, high motivational activation stimuli are needed (Bradley & Lang, 2007).

The contracting of the heart and blood pumping to various body areas can be recorded via electrocardiogram (ECG; the study of electrical changes during the heart's contractions; Andreassi, 2007). After inducing students through music elicitation (emotions included joy and pleasure), Xun and Zheng (2013) reported when heart rate variability (HRV; the varied time interval between heart beats) was pulled from the ECG signal that joy and pleasure could be recognized with a high accuracy rate using a support vector machine (SVM; an algorithm and supervised learning model which recognizes and classifies patterns). Schut et al (2010) showed significant interactions between emotions elicited and HRV activity amongst persons during film clip viewing. Codispoti, Bradley, & Lang (2001) showed that cardiac activity is highly dependent on the duration and presence of sensory information presentation.

Stern et al (2001) emphasized the findings of Lacey (1959) mentioning "that no one measure of bodily arousal was adequate in relation to either psychological process variables or other physiological measures." Stern et al (2001) also summarized the conclusions of psycho physiological pioneers Chester Darrow and R.C. Davis in suggesting that future research focus on discovering patterns in the above and other such recordings. This work seeks to address such issues.

2.7 Emotion Elicitation

Affective science is a growing field and the techniques of eliciting emotions amongst humans is vast including images and sounds (Bradley & Lang, 2007; Wiens & Ohman, 2007), expressive behaviors (Ekman, 2007; Laird & Strout, 2007), scripted and unscripted social interactions (Harmon-Jones, Amodio, & Zinner, 2007; Roberts, Tsai, & Coan, 2007), and music (Eich, Ng, Macaulay, Percy, & Grebneva, 2007). The use of film clip stimuli can also be included in this list where they have been used to evoke brief affective responses in the emotion response system (Rottenberg, Ray, & Gross, 2007; Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Tomarken, Davidson, & Henriques, 1990; Rosenberg & Ekman, 1994; Kreibig, Wilhelm, Roth, & Gross, 2007; Bartolini, 2011). Emotions, unlike moods, are tied to specific objects or elicitors (real or imagined) and are multi-component, involving changes in cognitive, experiential, and central physiological, peripheral physiological, and behavioral response systems (Lang, 1978; Rottenberg, Ray, & Gross, 2007). Film stimuli will be used in this experiment.

The key dimensions of film stimuli are intensity (considers the response strength and the awareness of multi-response system activation); complexity (considers the variability of clips, e.g. silent vs. auditory or color vs. black & white); attentional capture (attention required to operate); demand characteristics (considers the context, i.e. the back-story and the instructions used in the viewing of the clip); standardization (e.g. stimulus content, presentation apparatus and viewing condition); temporal considerations (the data collection of responses over time, especially when they can occur over seconds or milliseconds); and ecological validity (considering the realism and illusion of clips and potential for human reaction) (Rottenberg, Ray, & Gross, 2007).

Additionally, it is important to consider how the clips are matched across their differences (e.g. length and activation level) as well as the length of clip to use and the number of clips to use over an experimental session (considerations include fatigue effects over time, attention span and participant availability) (Rottenberg, Ray, & Gross, 2007). For example in regards to timing, a negative valence clip shown at the end of a 2-hour session may not be rated the same as it would be at the beginning of the session. Carryover effects may also become apparent when films of the same valence are adjacent to one another or presented in block order (Rottenberg, Ray, & Gross, 2007; Branscombe, 1985; Neumann, Seibt, & Strack, 2001). This will be accounted for through counterbalancing of treatment conditions. However, it is believed that the characteristics of the video clips, in terms of their perceptual and cognitive attributes, will not be equivalent.

3.0 METHODS, ASSUMPTIONS, AND PROCEDURES

3.1 Participants

A total of 36 participants were recruited from the Air Force Research Laboratory, Wright State University, and the Air Force Institute of Technology. All participants were at least 18 years of age and were screened for normal color vision before being allowed to participate. The number of participants to be used in the study was in multiples of eight to accommodate the experimental block design. Due to technical issues involving the BioNomadix sensors and data loss of one dataset, 4 additional replacement participants were required above 32. All participants were given $46 for participating.

3.2 Demographic Descriptors

Table 1. Demographic Frequencies

			Frequency	Percent	Valid Percent
Gender			Frequency	Percent	Valid Percent
	Valid	Male	17	50.0	51.5
		Female	16	47.1	48.5
		Total	33	97.1	100.0
	Missing	System	1	2.9	
	Total		34	100.0	
Military			Frequency	Percent	Valid Percent
	Valid	Non-Military	28	82.4	84.8
		Military	5	14.7	15.2
		Total	33	97.1	100.0
	Missing	System	1	2.9	
	Total		34	100.0	
Occupation			Frequency	Percent	Valid Percent
	Valid		1	2.9	2.9
		Army Reserve	1	2.9	2.9
		Computer Science	1	2.9	2.9
		Division Director	1	2.9	2.9
		food service worker	3	8.8	8.8
		lifeguard	1	2.9	2.9
		medical career	4	11.8	11.8
		none/unemployed	7	20.6	20.6
		researcher/scientist	2	5.9	5.9
		retail sales associate	1	2.9	2.9
		student/intern	11	32.4	32.4
		YMCA front desk	1	2.9	2.9
		Total	34	100.0	100.0

Lenses			Frequency	Percent	Valid Percent
	Valid	No Lenses	24	70.6	72.7
		Wears Lenses	9	26.5	27.3
		Total	33	97.1	100.0
	Missing	System	1	2.9	
	Total		34	100.0	
Dominant Hand					
	Valid	Right	26	76.5	76.5
		Left	8	23.5	23.5
		Total	34	100.0	100.0
Joystick Hand			Frequency	Percent	Valid Percent
	Valid	Right	28	82.4	82.4
		Left	6	17.6	17.6
		Total	34	100.0	100.0
Medications?			Frequency	Percent	Valid Percent
	Valid	No Medications	33	97.1	97.1
		On Medication	1	2.9	2.9
		Total	34	100.0	100.0

Table 2. Demographic Descriptors

	N	Minimum	Maximum	Mean	Std. Deviation
Age	33	18	59	24.45	9.391
Years of Higher Education	33	12	16	14.00	1.732

3.3 Apparatus and Stimuli

3.3.1 Experimental control system

Participants engaged in the Air Force MATB's (Multi-Attribute Task Battery) Tracking and Fuel Management tasks in the form of a computer game, as described above. During experimental sequences, room lighting was dimmed to a controlled low level. The subject station consisted of a single 24-inch wide-screen monitor for task operation and questionnaire completion. Video clip stimuli were displayed on a 50-inch monitor positioned directly above and behind the 24-inch monitor. An Onkyo surround-sound system was used for video clip audio stimuli. A standard ambidextrous gaming joystick was used for task operation. Windows 7 x64 was used on all high-performance computer systems. Experimental control software was developed in-house on contract by a Sumaria Systems Inc. contractor, written primarily in Java. All questionnaires, experimental sequences (videos, task, etc) were fully automated and pre-programmed for each experimental condition and ordering.

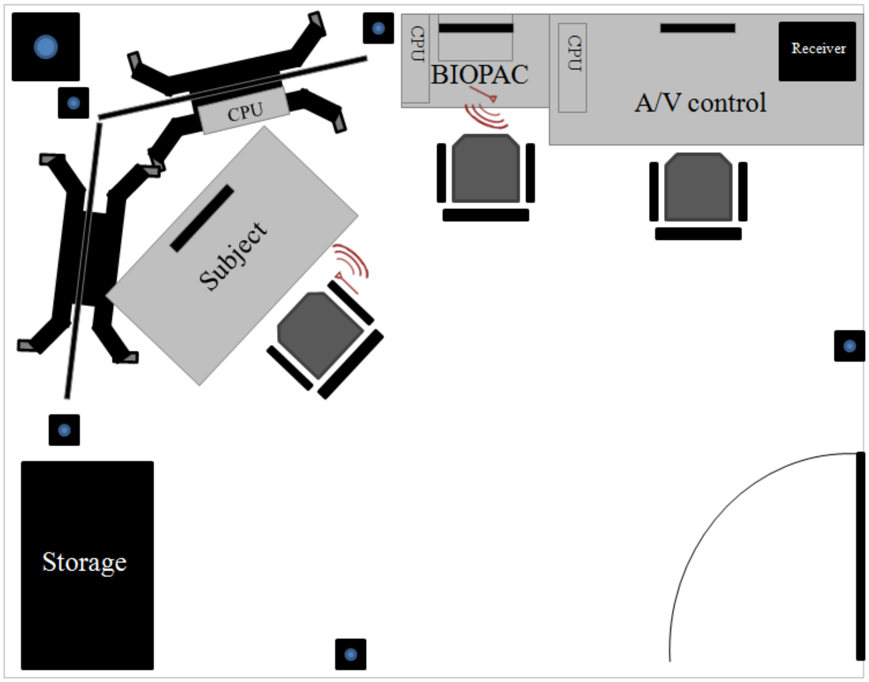


Figure 8. Cyber Affect Laboratory

3.3.2 Room Temperature

Room temperature data logging was accomplished with a battery powered Lascar USB temperature/humidity logger positioned near the middle of the room approximately five feet from the floor.

3.3.3 Wireless Physiological Sensors

This experiment utilized Biopac BioNomadix wireless transducers and the Biopac AcqKnowledge software application for physiological assessment. In an attempt to correlate participant affect states and performance with basic physiological signals, the following sensors were used in this research: *Electromyogram (EMG)*, *Electro dermal Activity (EDA)*, *Electrocardiogram (ECG)*, *Respiration Rate (RSP)*, *Skin Temperature (SKT)*, *Electrooculogram (EOG)*, and *Photoplethysmogram (PPG).*

None of the Biopac devices introduced any form of electric current across the body, and each was a passive measure of amplified physiological-currents or conductivity. EMG assessment used solid-gel Ag-AgCl 1” electrodes, which did not require skin abrasion for placement. In this study, EMG was used to measure somatic nerve activation of the corrugators supercilii and zygomaticus major facial muscles. EOG assessment also used solid-gel Ag-AgCl electrodes placed above and below the right eye and on both temples to amplify signals produced by horizontal and vertical eye muscle saccades. EDA assessment used pre-gelled Ag-AgCl electrodes to measure the electrical skin conductance of the palm (non-joystick hand), which changes in proportion to sweat gland activity and is used as a measure of autonomic nervous system activity. ECG assessment used pre-gelled Ag-AgCl electrodes to measure cardiac nerve muscle activation patterns and to determine heart rate (HR), inter-beat-interval (IBI), and heart-rate variability (HRV). RSP assessment used two respiration transducer bands measuring thoracic and abdominal breathing patterns. SKT assessment used a slow and a quick response thermister to determine skin temperature in various areas of interest. For this study, the slow response thermister was taped against the skin under the armpit area over the brachial artery with medical tape to measure central body temperature. The quick response thermister was taped to the 5th digit (little finger) of the non-joystick hand to measure peripheral body temperature. PPG assessment used an ear-lobe affixed photoelectric transducer to measure visual blood flow beneath the skin, taken as a measure of basic pulse rate at the peripheral areas to be compared with ECG as a derived measure of pulse-transit time (PTT).

Based on the criteria for affect induction described above, the following film stimuli clips were utilized in this experiment:

Table 3. Affect State Induction Clips

Valence	Treatment Condition #	Film Title	Reference	Film Clip Duration (sec)	Film Description
Positive	1	The Dead Poets Society	(Schaefer, Nils, Sanchez, & Philippot, 2010)	307	All the students climb on their desks to express their solidarity with their teacher, who has just been fired.
Positive	2	When Harry Met Sally	(Gross & Levenson, 1995)	155	Sally simulates an orgasm in a restaurant
Positive	3	Puppy	(Fredrickson & Levenson, 1998)	55	Puppy fights with flowers.
Positive	4	Benny and Joon	(Schaefer, Nils, Sanchez, & Philippot, 2010)	86	A man plays the fool in a coffee shop.
Negative	5	Misery	(Schaefer, Nils, Sanchez, & Philippot, 2010)	75	A woman breaks a man's legs.
Negative	6	Cat's Eye	(Fredrickson & Levenson, 1998)	225	A man inches along the ledge of a high rise building and at one point loses his grip.
Negative	7	The Champ	(Gross & Levenson, 1995)	171	A young boy cries as he watches his father die.
Negative	8	The Piano	(Schaefer, Nils, Sanchez, & Philippot, 2010)	156	One of the characters gets her finger cut off.

3.3.4 Participant Compensation

Participants were instructed before beginning that they would receive $30 for simply participating, and up to a $16 bonus for consistently performing well in the task. Performing "well" was determined by a MATB performance baseline established during training. Pilot testing showed that a general population score leveled off after about six or seven practice two-minute trials, or 12-14 minutes of total task training time. This was sufficient to eliminate the majority of the learning/practice effect. The last three practice trials were averaged to establish the normal performance score per minute baseline and used as the upper limit for performing "well" with the lower limit being 80% of this value. Performing "adequately" was defined for each participant as between 60-80% of this value, and "poorly" was below 60% of this value. Mean performance (score) for each trial was calculated and returned to the experimenter at the end of the experiment, and each trial's compensation bonus was calculated and summed together based on the following performance-compensation rules: poor = $0.25; adequate = $0.50; well = $1.00.

The total compensation amount of $30 + $bonus was planned to be given to the participant at the conclusion of the experiment and the participant was not informed of the amount at any point during the experiment. However, due to various software issues and thereby uncertainty in the automated calculator, it was determined the best course of action would be to give the full amount of $46 to each participant at the conclusion of the experiment regardless of performance. This would avoid 'shorting' the participant due to possible summation errors. The monetary incentive to the participant to perform to their utmost ability was retained with this method, as the participant was under the impression until the end of the experiment that their 'bonus' amount was contingent upon performing well.

3.4 Procedure

This experiment used a repeated measures design in the A x B x s design family, a two factor within-subject design, broken down further by Session (1 v 2): Session X Attack Type X Video Valence X Subject. Each experimental sequence involved a single participant. Each sequence consisted of obtaining informed consent, training on the AF_MATB task, introductory questionnaires, several experimental data collection trials, and end-of-session questionnaires. Factor A was the attack location/type (AL with 4 levels) and factor B was the valence of the Video clip (VV) presented before each AF_MATB operating period (VV with 2 levels). This 4 x 2 x s design used 8 treatments (combinations of independent variable levels) repeated twice, totaling two sessions or 16 trials. Treatment levels are shown in Table xx below. The order of treatment conditions presented to each participant was counterbalanced to minimize first-order carryover effects.

Table 4. Treatment List

Treatment	Attack Location Level	Video Valence Level
T1	None	+

T2	Time	+
T3	Fuel/Rsrc Mgmt	+
T4	Score	+
T5	N	-
T6	T	-
T7	F	-
T8	S	-

The following outline demonstrates the order of events in which questionnaires and procedures were distributed, explained, and collected, at what point participants performed the task itself, collection and analysis of physiological data using Biopac, and additional participant monitoring via audio-visual systems (no audio-visual recordings were made or retained).

The experimenter was initially in the room to prepare the participant, the computer system, equipment, automated trait questionnaires, and cognitive tests. During the experimental sequences, the experiment was controlled remotely from a separate lab space to minimize any presence effects during affect measurement, emotion elicitation, or task performance. The experimenter was able to operate the participant computer remotely, and communicate and view the participant from a separate room.

Presented during the initial questionnaires, experimental baselines for Affect were assessed by the PANAS-X mood state indicator, the Affect Grid, and the affect slider bars. Affect slider bars were used to measure in a linear method the two main dimensions of affect, valence and arousal. It was used as an experimental check on the Affect Grid to determine if participants understood the Grid. These separate measures should theoretically be perfectly correlated if participants understood what was being asked of them subjectively. These initial measures were collected in order to establish a baseline in the affect data based on each participant, which would eliminate some random variability in the data across participants. The IPIP, STEM, and CANTAB cognitive tests (IED, SOC, CRT) described above (Section 2.6) were administered at this time. The IPIP and STEM were administered via the experimental control program and auto-coded. The cognitive tests were administered by the experimenter via a CANTAB tablet computer running the assessment software. These initial questionnaires and testing took approximately 45 minutes.

Training on the task began after initial questionnaires and cognitive testing was completed. An introduction training video was played which instructed the participant on the operation of the task. This was pre-recorded to ensure training consistency among all participants. Any questions the participant had following the video would be answered by the experimenter. The training consisted of the participant operating the standard no-attack condition for seven trials, each two minutes in duration, or 14 minutes of task training. The experimenter would assist the participant in learning the task during this hands-on portion of training, instructing participants on the optimal strategy for scoring points.

When training was complete, the participant was taken to a separate room for physiological sensors to be attached. Once satisfied with the correct function of the sensors, the experimenter would engage the temperature data logger and prepare the room for task and video operation. Once satisfied, the experimenter would leave and remotely start the first of 16 trials. At the instantaneous start of the first trial, the Biopac system was engaged by electronic trigger in order to exactly synchronize the time counters between the AcqKnowledge software and the Java experimental data output software. The experimental time in milliseconds for each event in an experimental sequence was captured by the Java software program and output at the conclusion of the entire sequence. For example, the Trial 1 neutral clip was recorded as the 0ms mark with the Trial 1 video clip starting around 75,000ms, etc. These time-count event marker delineations were used to parse the AcqKnowledge physiological data files during post-analysis.

Each trial began with a neutral clip for one minute. This clip was a recorded ‘screensaver’ type stimulus that was intended to focus the participant on the large monitor and neutralize affect state. Following this, a pre-recorded synopsis of the upcoming video clip was played to introduce the participant to the clip in the context of the overall feature movie if necessary. Once the synopsis was read, the experimental movie clip stimulus was played. During the video clip, a ‘continuous’ affect grid was displayed on the participant station. The participant was instructed to move or click on the affect grid constantly during the clip as their mood state changed. The current position of the affect grid block was recorded every 100ms. These data were summarized post-experiment for minimum, maximum, and mean values per clip dataset as a means to assess affect induction during video clip stimuli. Once the video stimulus was complete, the Affect Grid was presented followed by the PANAS-X mood state indicator and a film response questionnaire.

When the pre-task questionnaires were completed, the AF_MATB task window appeared on the participant station. When the participant was ready to begin the task, they would press the spacebar and would be given a five-second countdown. When the task began, an event marker was written into the data log. Each AF_MATB task was 60 seconds in duration. Following the task, the Affect Grid, PANAS-X, and NASA TLX were presented. This completed a single standard trial.

After 8 trials, the subject was given a 3-5 minute break for a snack or to use the restroom. When the subject returned, they were given the trial order again. The first session was condition order sequence AB (1-8), second session sequence was BA (9-16), completing the ABBA design. Following completion of trial 16, a debriefing questionnaire was presented. When complete, the participant was taken to a separate room to detach the physiological sensors and receive the $46 in compensation. Any questions were answered by the attending researcher and the participant was dismissed. The average experiment took 4 hours from subject arrival to dismissal.

Example Experimental Sequence

- Experimenter (E) sets-up facility
- Ceiling lights at bright level
- Participant (P) enters room
- E instructs P to sit at workstation
- E introduces the experiment to P
- E asks P to fill out the Informed Consent Document
- P completes and signs the Consent Form and gives it to E – E signs it
- E gives P a basic color vision screening test to ensure normal color vision.

- E gathers trait, state, EI, and cognitive ability information using the workstation
  - Workstation presents Demographic Questionnaire (Appendix F)
  - Workstation presents Emotional Intelligence questionnaire (Appendix G)
  - Workstation presents Cognitive Tests (Appendix L)
  - Workstation presents EPIP-NEO personality inventory (Appendix H)
  - Workstation presents Affect Grid & Sliders (Appendix K) for baseline
  - Workstation presents PANAS-X Mood State Indicator (Appendix J) for baseline

- E trains P on the AF_MATB task – training criteria met (see above)
- E attaches BioPac sensors to P
- E verifies BioPac is being collected and recorded
- E leaves room and operates systems remotely
- Trials begin as outlined below

Example Trial:
VV= Video Valence
VC= Video Clip
T#=Treatment number (1-8)
AL=Attack Location / Type (N=none; T=tracking; F=fuel/resource; S=score)

<u>Trial 1 – Treatment-1</u>

1. Begin Neutral Clips (screensaver) – 1 minute
   Clip Ends

2. Begin Upcoming Clip Synopsis video
   Synopsis Ends

3. Begin first video clip {**VV+**, **T1**}
   Continuous Affect Grid displayed during presentation of clip
   Clip Ends

4. Workstation presents Affect Grid & Sliders (APPENDIX G)
5. Workstation presents PANAS-X (APPENDIX F)
6. Workstation presents Film Response Questionnaire (APPENDIX A)

7. Workstation begins AF_CYBER_MATB task {AL(**N**), **T1**}– 60 sec duration
   Task Ends

8. Workstation presents Affect Grid & Sliders (APPENDIX G)
9. Workstation presents PANAS-X (APPENDIX F)
10. Workstation presents NASA TLX (APPENDIX E)
    Trial Ends

- Complete trials 1-8 to complete Session 1 (AB)
- Participant takes 3-5 minute break
- Complete trials 9-16 to complete Session 2 (BA)
- Trials end; Debriefing questionnaire (APPENDIX I) administered
- Compensation disbursed
- Final debriefing statement given to participant
- Participant dismissal

4.0 RESULTS AND DISCUSSION

This study involved the use of several independent, dependent, and attribute variables. Each of these variables is listed in Table 5. Descriptors of independent, dependent, and derived variables and in Table 6. Attribute-type variables along with the variable's type and range as observed in the study's data. Section Four of this report describes the results. Section Five of this report discusses the results and their implications. The results of this study indicate that a complex interaction of factors has a significant effect on that participant's performance of the AF-MATB tasks and that emotional state changes are observable. It is also clear from these analytical results and graphical depictions that significant interactions exist among the variables for session, attack type, valence, gender, age, cognitive ability, and emotional management ability. The implications of the study results are broad.

Table 5. Descriptors of independent, dependent, and derived variables

Variable Name	Description	Type	Minimum	Maximum
Attack_Ty	Target of Simulated Information Attack	Independent	N/T/F/S	N/T/F/S
Valence_S	Video Clip Valence	Independent	Positive/Negative	Positive/Negative
Trial Sco	Task Score per Trial	Dependent	-93062	49240
REL_SCORE	Task Score Relative to No Attack Baseline	Dependent(derived)	-80469	36098
TLX_MD	NASA TLX Rating	Dependent	0.0	1.0
TLX_PD	NASA TLX Rating	Dependent	0.0	1.0
TLX_Prfm	NASA TLX Rating	Dependent	0.0	1.0
TLX_Efrt	NASA TLX Rating	Dependent	0.0	1.0
TLX_Frus	NASA TLX Rating	Dependent	0.0	1.0
PTT_1	Pulse Transit Time- epoch 1(ms)	Dependent	142	888
PTT_2	Pulse Transit Time- epoch 2(	Dependent	152	844
PTT_3	Pulse Transit Time- epoch 3(	Dependent	79	1971
PTT_4	Pulse Transit Time- epoch 4(	Dependent	134	641
HR_1	Heart Rate-epoch 1(bpm)	Dependent	42	104
HR_2	Heart Rate-epoch 2(bpm)	Dependent	43	105
HR_3	Heart Rate-epoch 3(bpm)	Dependent	46	122
HR_4	Heart Rate-epoch 4(bpm)	Dependent	49	125
EDA_1	Electro-dermal Activity-epoch 1(smho)	Dependent	0.004	28.995
EDA_2	Electro-dermal Activity-epoch 1(smho)	Dependent	0.051	28.28
EDA_3	Electro-dermal Activity-epoch 1(smho)	Dependent	0.052	23.54
EDA_4	Electro-dermal Activity-epoch 1(smho)	Dependent	0.005	33.41
DEL_HR_C	Heart Rate change during video replay	Dependent(Derived)	-38	40.25
DEL_PTT_C	PTT change during video replay	Dependent(Derived)	-438	394
DEL_EDA_C	EDA change during video replay	Dependent(Derived)	-5.06	10.85
DEL_HR_T	Heart Rate change during task	Dependent(Derived)	-49.17	43
DEL_PTT_T	PTT change during task	Dependent(Derived)	-1580	321
DEL_EDA_T	EDA change during task	Dependent(Derived)	-6.34	5.48
DEL_HR_R	Heart Rate change across trial	Dependent(Derived)	-45	54.58
DEL_PTT_R	PTT change across trial	Dependent(Derived)	-461	226
DEL_EDA_R	EDA change across trial	Dependent(Derived)	-8.92	10.58
AR_AS_Pre	Pre-trial Arousal with Slider	Dependent	1	9
AR_AS_Post	Post-trial Arousal with Slider	Dependent	1	9
VA_AS_Pre	Pre-trial Valence with Slider	Dependent	1	9
VA_AS_Post	Post-trial Valence with Slider	Dependent	1	9
AR_AG_Pre	Pre-trial Arousal with Affect Grid	Dependent	1	9
AR_AG_Post	Post-trial Arousal with Affect Grid	Dependent	1	9
VA_AG_Pre	Pre-trial Valence with Affect Grid	Dependent	1	9
VA_AG_Post	Post-trial Valence with Affect Grid	Dependent	1	9
PNS_N_Pre	Pre-trial PANAS-N	Dependent	10	47
PNS_N_Post	Post-trial PANAS-N	Dependent	10	40
PNS_P_Pre	Pre-trial PANAS-P	Dependent	10	50
PNS_P_Post	Post-trial PANAS-P	Dependent	10	50

Table 6. Attribute-type variables

Variable Name	Description	Type	Minimum	Maximum
Stgs_raw	Stages Completed-raw score	Attribute	7	9
Stgs_std	Stages Completed-standardized score	Attribute	-1.04	0.46
Tot_E_raw	Total Number of Errors-raw	Attribute	6	68
Tot_E_adj	Total Number of Errors-adjusted	Attribute	6	68
Tot_E_raw_std	Total Number of Errors-stamdard score	Attribute	-4.01	1.05
Tot_E_adj_std	Total number of Erors-adj-standard score	Attribute	-1.1	0.76
M_T_Time	Mean Initial Thinking Time	Attribute	0	26956
M_T_Time_std	Standardized Mean Initial Thinking Time	Attribute	-1.48	1.37
S_T_Time	Mean Subsequent Thinking Time	Attribute	0	6709.7
S_T_Time_std	Standardized Mean Sub. Thinking Time	Attribute	-1.18	0.70
No_Prbm	Number of Problems solved	Attribute	4	12
No_Prbm_std	Number of Problems solved-stnd score	Attribute	-2.03	1.9
Crt_Ltncy	Latency	Attribute	261.66	452.02
Max_Crt_ Ltncy	Maximum Latency	Attribute	348	1279.0
SD_Crt_ Ltncy	Latency-std deviation	Attribute	27.8	132.78
Pct_Correct	Percent Correct	Attribute	95.0	100.0
Age	Age	Attribute	18	59
Gender	Gender	Attribute	M/F	M/F
Mil_Membr	Member of the military	Attribute	Y/N	Y/N
Yrs_Ed	Years of Formal Education	Attribute	12	16
Occupation	Occupation	Attribute	NA	NA
Lenses	Participant rewuire Eye-glasses	Attribute	Y/N	Y/N
IPIP_1	International Personality Item Pool	Attribute	0.1750	1.0
IPIP_2	International Personality Item Pool	Attribute	0.4000	1.0
IPIP_3	International Personality Item Pool	Attribute	0.1375	1.0
IPIP_4	International Personality Item Pool	Attribute	-0.0250	1.0
IPIP_5	International Personality Item Pool	Attribute	-0.025	0.1875
ERA_MER	Situational Test of Emotional Mgt.	Attribute	0.7621	0.9656
ERA_PEC	Situational Test of Emotional Mgt.	Attribute	0.2820	0.8538
AR_AS_Bse	Baseline-Arousal with S;ider	Attribute	1	9
VA_AS_Bse	Baseline-Valence with Slider	Attribute	4	9
AR_AG_Bse	Baseline Arousal with Affect Grid	Attribute	1	9
VA_AG_Bse	Baseline- Valence with Affect Grid	Attribute	5	9
PNS_N_Bse	Baseline –PANAS-N	Attribute	10	28
PNS_P_Bse	Baseline –PANAS-P	Attribute	15	50

Experimental data were collected using 36 participants. Of the 36 participants, data from 30 were utilized in subsequent analyses. The data from six participants were unusable because of various hardware issues during the experimental trials or extremely low signal to noise levels in the physiological data probably caused by improper electro placement on the participant, resulting in heartbeat patterns that were not reliably discernible in the recorded data. Data from 33 of the 36 original participants were used in the analysis of system change perception as these data were not corrupted by technology issues.

4.1 Task Performance Analyses of Independent Variable Effects

An initial repeated measure Analysis of Variance (ANOVA) was conducted to determine if, and to what extent, the independent variables exerted statistically significant affect on task performance as measured by the score achieved by the participant over the experimental trial. The Geisser-Greenhouse and Huynh-Feldt corrections were averaged and applied to the resulting F statistic where appropriate as determined by the non-spheriscity of the data. This correction resulted in a more conservative interpretation of statistical significance than would be applied without the correction in situations when p is close to but less than .05.

Prior to the experimental trials, the participants were trained on the task for familiarization only. The participant's strategy for accomplishing the task was not constrained. Due to this, the level of scoring at the completion of training was stable but not equivalent across participants. In other words, each participant's baseline task performance varied. To account for this, an estimated baseline was derived for each participant by identifying the maximum of the 4 raw scores associated with the "No Attack" treatment condition for each participant. This maximum value was then used as the baseline performance for that participant. The trial scores (Rel_Score) were then derived by subtracting the individual baseline estimate from the raw score for each trial. The baseline was calculated individually for each subject.

Eight trial orderings were utilized and counterbalanced in the study as described in earlier sections. An ANOVA of task performance, as measured with the relative score, was performed investigating trial order as a between-subject factor. No significant main effect or interactions were observed in the results.

Independent variables included attack type simulated (Attack_Ty) and video clip valence state (Valence_S). A secondary variable was also utilized in the analysis to indicate the ordering of the data collection as described in the previous sections (Session) Results of the initial analysis are shown in APPENDIX O. Results of Stastical Analyses. A summary of the significant results is described in the following sections of this report. As can be seen in the ANOVA result appendix, there is a significant main effect on the task performance score from both the attack type and session ($F(3,87) = 72.68$; $p < .001$) and ($F(1,29) = 18.82$; $p < .001$), no significant effect from the video clip valence state, but a significant three-way interaction was observed between attack type valence state, and session ($F(3,87) = 2.93$; $p < .05$). These effects are depicted in Figure 9. Performance as a Function of Attack Type, Video Valence, and Session Number.

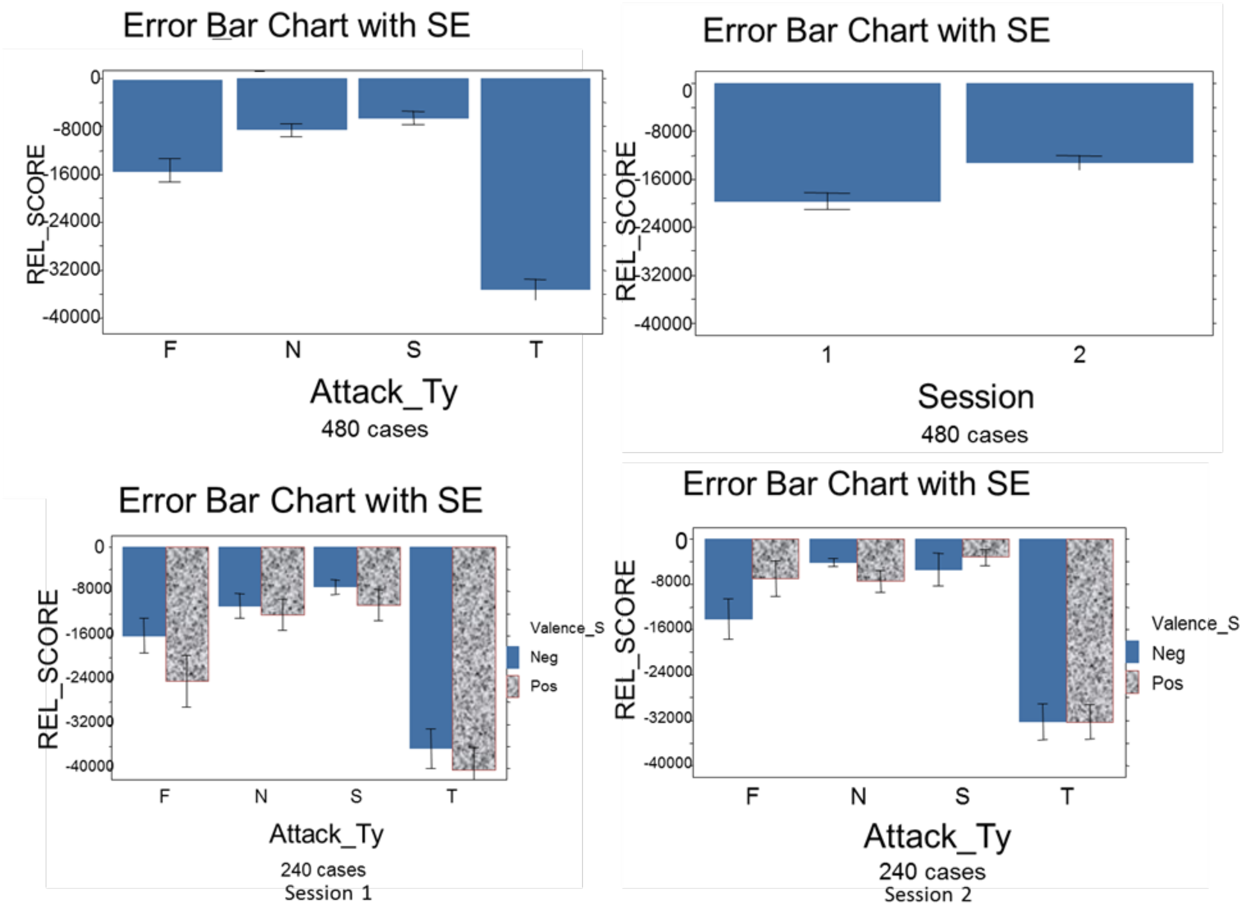


Figure 9. Performance as a Function of Attack Type, Video Valence, and Session Number

4.2 Analyses of Participant Attribute Affect on Task Performance

Participant cognitive abilities and personality composition may have influenced task performance. To investigate this possibility, participant cognitive abilities and personality composition, measured as attribute variables, were analyzed using a mixed between and within-subject analysis of variance. All individual attributes listed in Table 5. Descriptors of independent, dependent, and derived variables were treated as between-subject variables in this investigation as they are not assignable as are within-subject variables. No attempt was made by the researchers in the data collection phase to recruit participants with specific combinations of personality and cognitive capabilities. The personality trait and cognitive ability attribute variables were collected using questionnaires and cognitive testing as described in the earlier sections of this report. Each of the resulting attributes variables shown in Table 5. Descriptors of independent, dependent, and derived variables, were tested as between-subject variables with the within subject variables and utilized in a mixed-design repeated measures ANOVA. Significant results from these analyses are shown in APPENDIX O. Results of Stastical Analyses and are summarized in the following sections.

4.2.1 Participant Demographic Influences

Several of the participant's demographic information has a significant statistical affect on task performance as measured by the task's scoring algorithm at the completion of each trial. The participant's age (Age_L) interacted with attack type to significantly affect task performance (F(6,69) = 2.48, p < .035). Years of education (Ed_Yrs_L) interacted with attack type and session to significantly influence the relative score (F(6,63) = 2.43, p < .001) and (F(3,87) = 72.68, p < .001). These effects are depicted in Figure 10. Relative Score as a Function of Age and Educational Level.

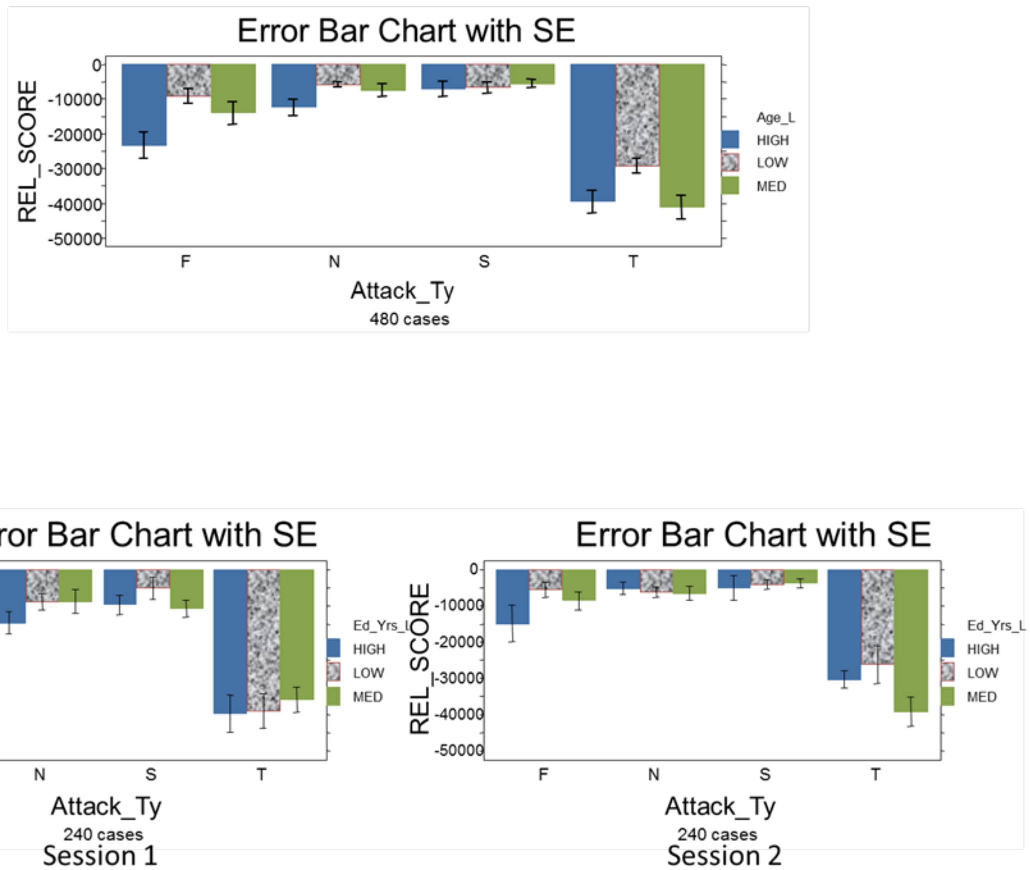


Figure 10. Relative Score as a Function of Age and Educational Level

4.2.2 Participant Trait Influences

Several of the measured cognitive ability variables appeared to significantly affected the relative score, those being the "Max thinking" times (M_T_Time_L) observed during problem solving activity in a four-way interaction with attack type, the valence of the video clip, and the session of the trial F(6, 69) = 2.45, p < .035). The mean thinking time (S_T_Time_L) significantly affected the relative score, observed during problem solving activity in a three-way interaction with the valence of the video clip and the session of the trial (F(2,21) = 4.03, p < .035). The total number of problems solved (No_Prb_L), interacting with session, significantly affected the relative score (F(2,21) = 7.12, p < .005). The total number of errors made (ToT_E_A_L), interacted with attack type and significantly affected the relative score (F(6,81) = 2.43, p < .035). The percentage of solved problems completed during the cognitive testing interval for each participant (P_Scor_L), interacted with attack type, significantly affected the relative scoring of the task (F(6,63) = 3.10, p < .015). P_Scor_L also significantly affected the relative score in a three-way interaction with attack type and session (F(6,63 = 2.75, p <.02). These effects are depicted in Figure 11. Participant traits influenced performance.

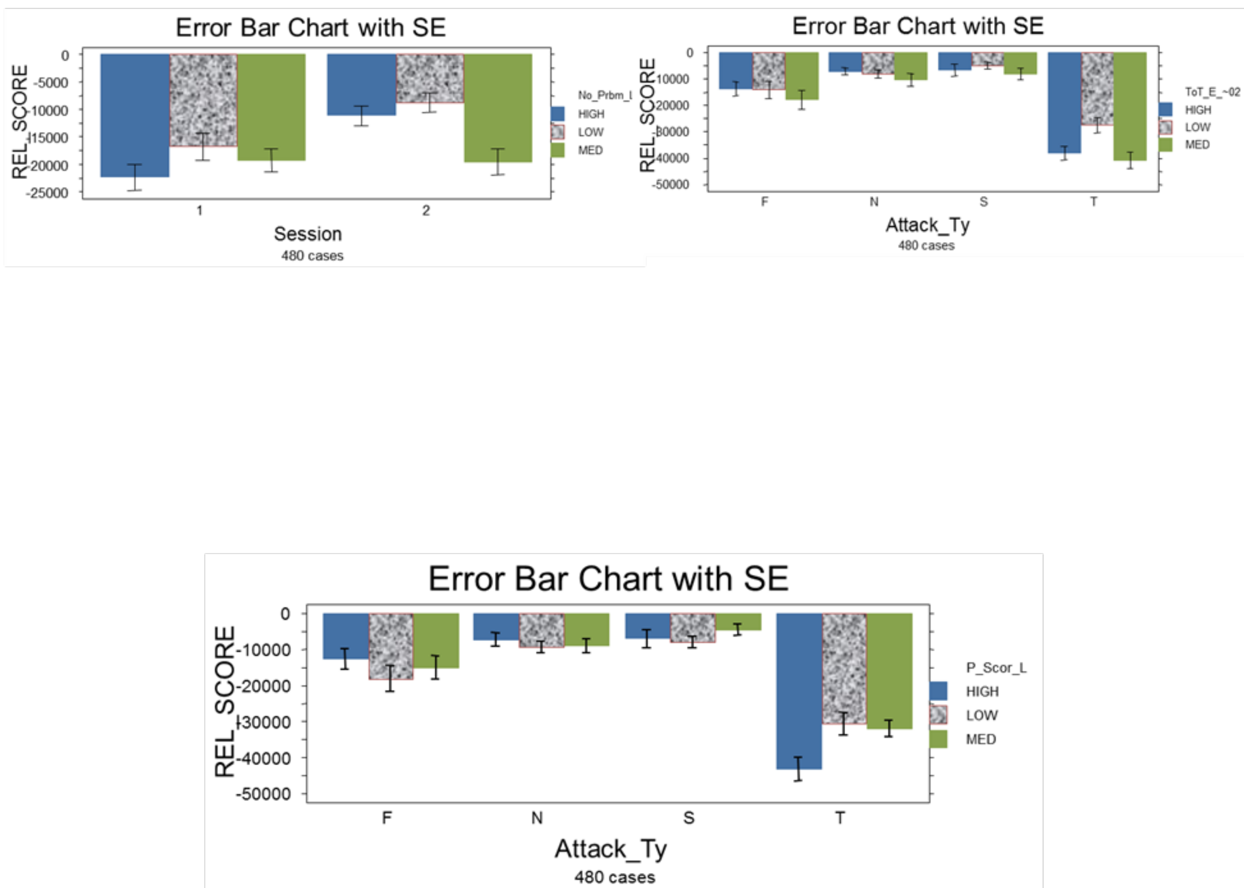


Figure 11. Participant traits influenced performance

Of particular note was that none of the “Big-5” personality trait dimensions nor emotional stability measures exhibited a statistically significant affect on the relative score.

An interaction effect was found to influence score by attack type and the emotion management ability scored by the mean expert rating weights (F(3,60) = 2.823, p = .046. This is shown graphically in Figure 12. Emotional Management and Attack Type Affected Performance.

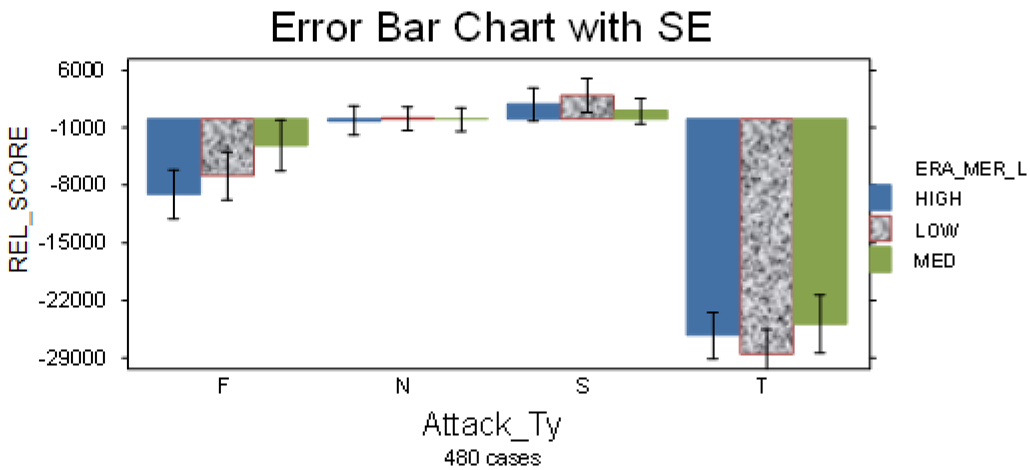


Figure 12. Emotional Management and Attack Type Affected Performance

4.2.3 Initial Affect State as an Attribute Factor

The participant's emotional state at the beginning of an experimental session can be thought of, from an analyses perspective, as an attribute of that participant as participants were used for only a single experimental period. However, no effect on the relative task scores was observed from the participant's initial emotional state as measured with the Affect Grid and the Affect Slider mechanisms.

4.3 Effects of Independent Variables on Physiological Measures

The existing literature describes the inferencing of affect state from physiological signals as a very difficult task (Wioleta, 2013). The capabilities of most individuals to mask, or control, their psycho-physiological signals is significantly lower that their ability to mask, or control, other affect state indicators such as their facial recognition, or verbalizations. Because of this, the use of physiological signals to estimate and recognize affect state may provide methods for precise and unobtrusive affect state recognition. Unfortunately, the analyses of physiological signals for affect state recognition has to date produced conflicting results in the literature most likely due to the affect system's complexity and associated indirect, and summative, connections with the observables of the psycho-physiological system (Kreibig, Wilhelm, Roth, & Gross, 2007). For these reasons and based on existing literature, analyses for this study concentrated on the measures of heart rate, using EKG and PPG signals, and Electro-Dermal Activity, EDA. Pulse Transit Time (PTT), the duration of time between the R-peak in the EKG and the associated peak in the PPG, was also investigated as a dependent variable.

During this study, physiological data were collected as a single sample for each participant. The physiological measures were continuous variables sampled at 1 millisecond time increments during the duration of each experimental session using a MP150 data acquisition system from BIOPAC Systems Inc. This experiment utilized Biopac BioNomadix wireless transducers and the Biopac AcqKnowledge software application for physiological data collection. Physiological data collected was the Electromyogram (EMG), Electro dermal Activity (EDA), and heart rate in the form of the Electrocardiogram (ECG), and the Photoplethysmogram (PPG). Also collected were Respiration Rate (RSP), Skin Temperature (SKT), and Electrooculogram (EOG).

Significant differences can exist between the characteristics of psycho-physiological signals of individuals. To provide for an individualized baseline condition during each trial for each participant, and to provide for a finer level of precision in determining the timing of affect system changes if they exist in the data, four samples of the physiological signals were taken from each trial from each participant. This provided a total of 64 distinct time epochs, each of which were 12 seconds in duration and thus containing 12000 raw signal samples, over which the measure was counted. For example, the cardiac measures, Within each 12 second epoch, the initial "Q" peak was detected, the number of full "Q peaks following the first were counted, and then the number of "Q" peaks with the associated timing between the first and last, was used to calculate the heart rate. It was then rounded to the nearest 1 beat per minute (bpm). The EDA was averaged across the duration of each time epoch resulting in a single decimal number in uMhos. The Figure labeled Figure 13. Typical Individual Trial Sequence and Timing, depicts a typical event sequence for a single trial that is overlaid with the 12-second time epochs over which the physiological signals were measured.

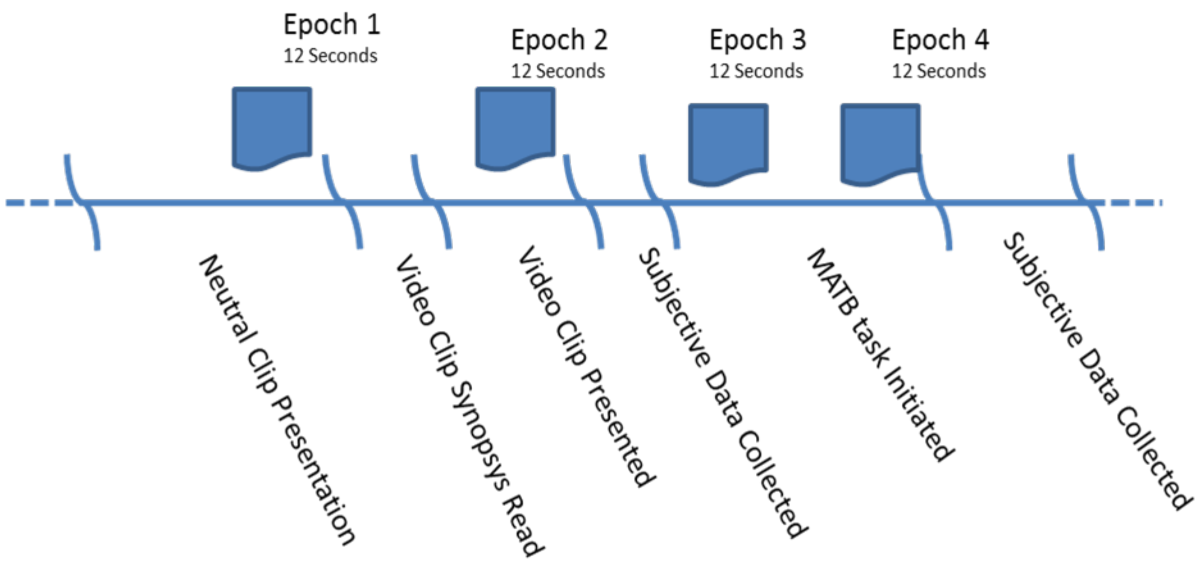


Figure 13. Typical Individual Trial Sequence and Timing

4.3.1 Heart Rate (EKG and PPG)

The participant's heart rate during epoch one (HR_1) was not significantly affected by any of the independent variables. The participant's heart rate during epoch two (HR_2) was significantly affected by attack type ($F(3,87) = 4.46$, $p < .006$). The participant's heart rate during epochs three (HR_3) and four (HR_4) was significantly affected by the valence of the video clip

(F(1,29) = 5.29, p < .03) and (F(1,29) = 5.19, p < .031). These effects are depicted in **Figure 14. Attack Type and Video Valence Influence Heart Rate**.

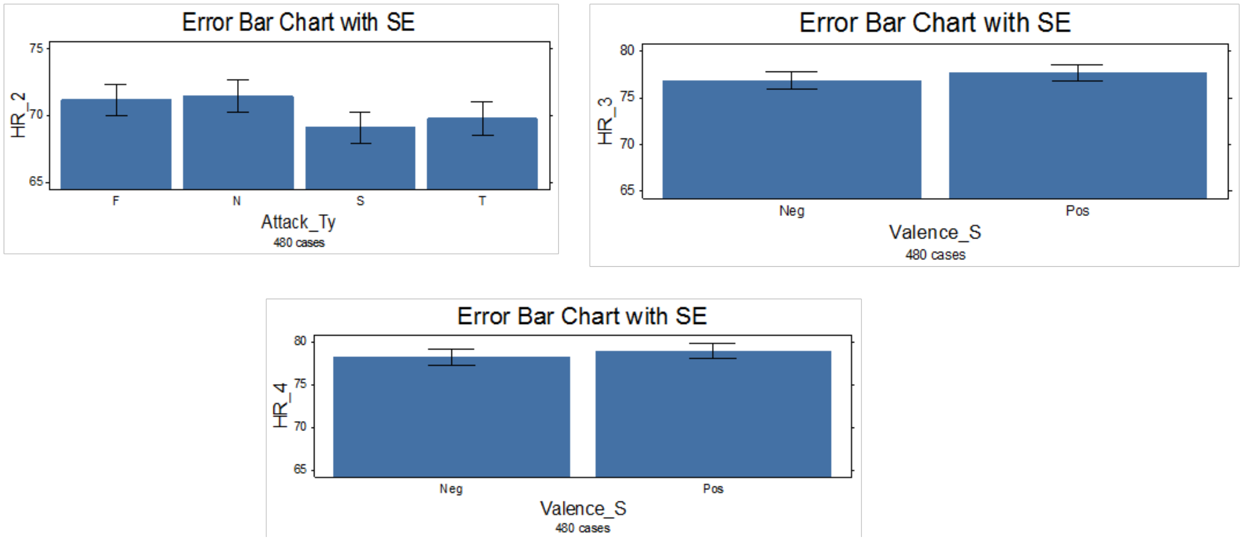


Figure 14. Attack Type and Video Valence Influence Heart Rate

Several measures based on differential heart rate were also calculated. The heart rate difference between epoch two and epoch one (DEL_HR_C) was significantly affected by both the valence of the video clip and the attack type (F(3,87) = 3.37, p < .025) and (F(1,29) = 4.19, p < .05). The heart rate difference between epoch four and epoch one (DEL_HR_R) was significantly affected by both the valence of the video clip and the session of the trial (F(1,29) = 6.82, p < .015) and (F(1,29) = 5.73, p < .025). The heart rate difference between epoch four and epoch three (DEL_HR_T) was not significantly affected by any of the independent variables. These effects are depicted in **Error! Reference source not found.**.

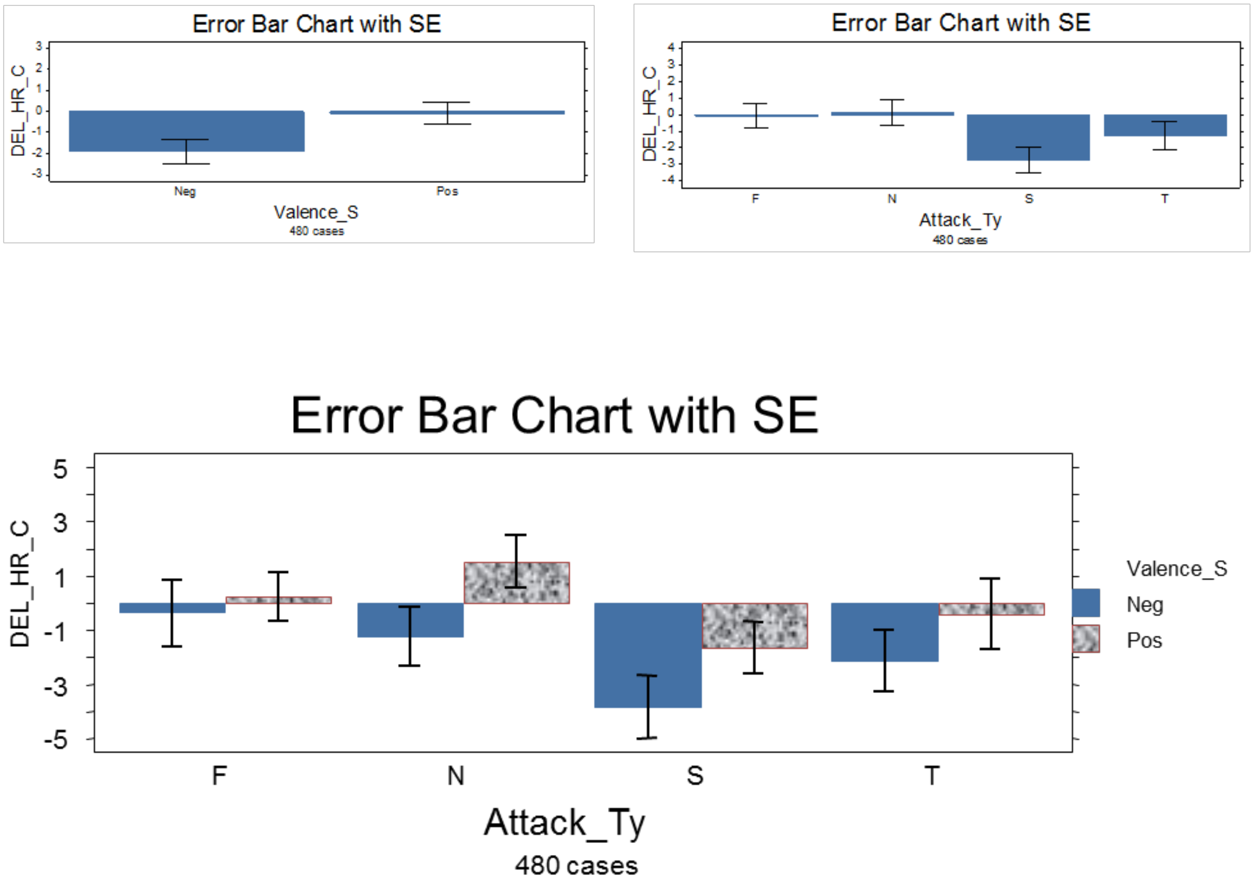


Figure 15. Change in Heart Rate during Video Clip Presentation

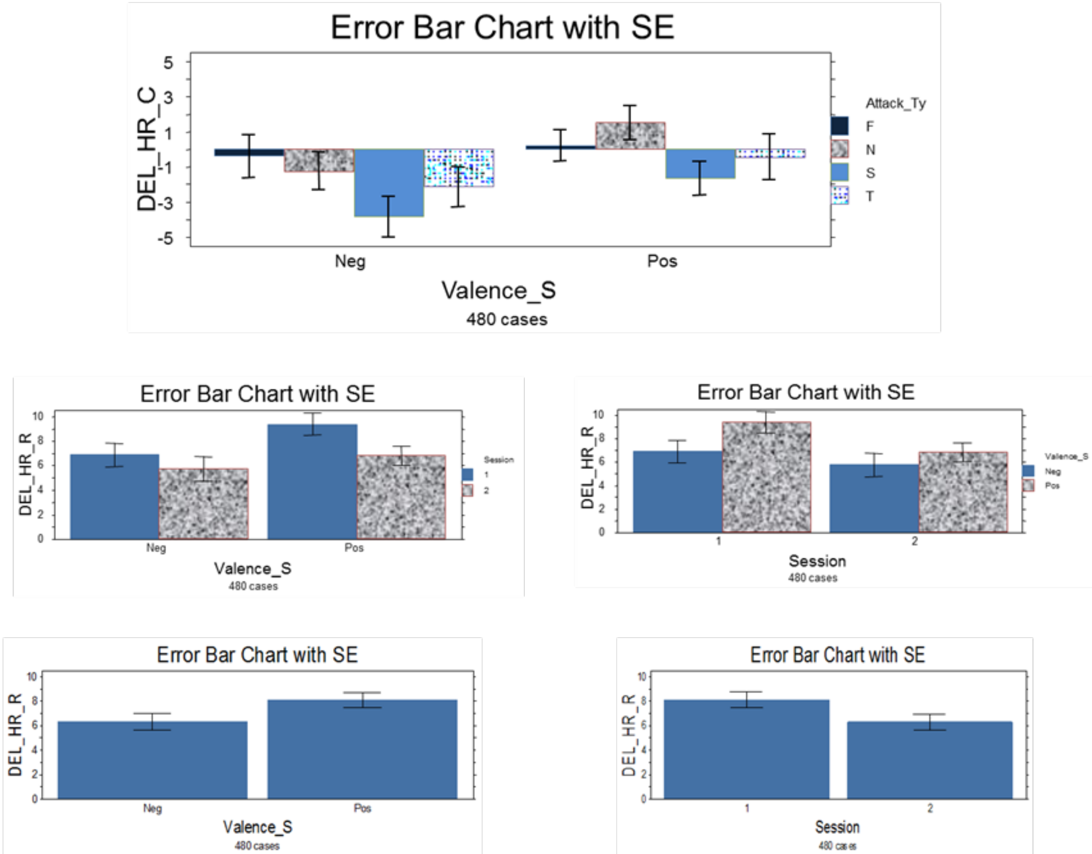
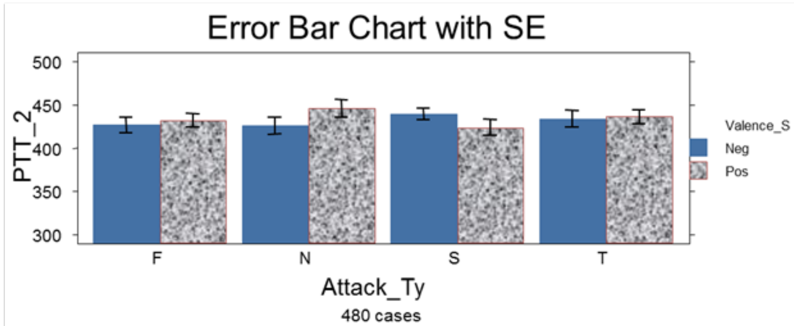


Figure 16. Change in Heart Rate during Video Clip Presentation and Trial

4.3.2 Pulse Transit Time (PTT)

Pulse Transit Times during epoch one (PTT_1) were not significantly affected by the independent variables. Pulse Transit Times during epoch two (PTT_2) were significantly affected by a three-way interaction of attack type, valence of the video clip, and the trial session ($F(3,87) = 2.86$, $p < .05$). This effect is depicted in Figure 17. Pulse Transit Times vary with Attack Type, Video Clip Valence, and Session. Pulse transit times during epochs three (PTT_3) and epoch four (PTT_4) were not affected significantly by the independent variables.



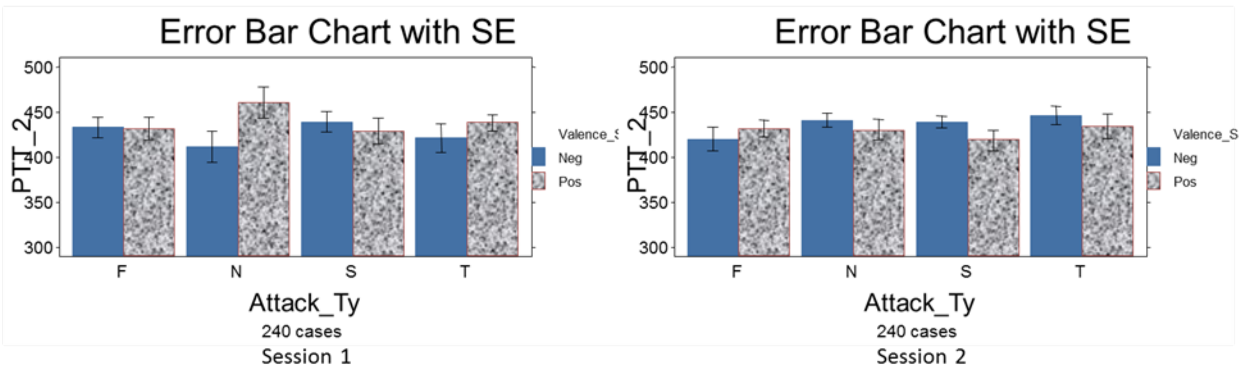


Figure 17. Pulse Transit Times vary with Attack Type, Video Clip Valence, and Session

Several measures based on differential pulse transit time were also calculated and analyzed. The pulse transit time difference between epoch two and epoch one (DEL_PTT_C) was significantly affected by a two-way interaction of valence of the video clip and trial session ($F(1,29) = 6.68$, $p < .02$). The pulse transit time difference between epoch four and epoch one (DEL_PTT_R) was significantly affected by a two-way interaction of attack type and the trial session ($F(3,87) = 3.13$, $p < .03$). The pulse transit time difference between epoch four and epoch three (DEL_PTT_T) was not significantly affected by any of the independent variables. These effects are depicted in

Figure 18. Change in Pulse Transit Time during Video Clip Presentation and **Trial**.

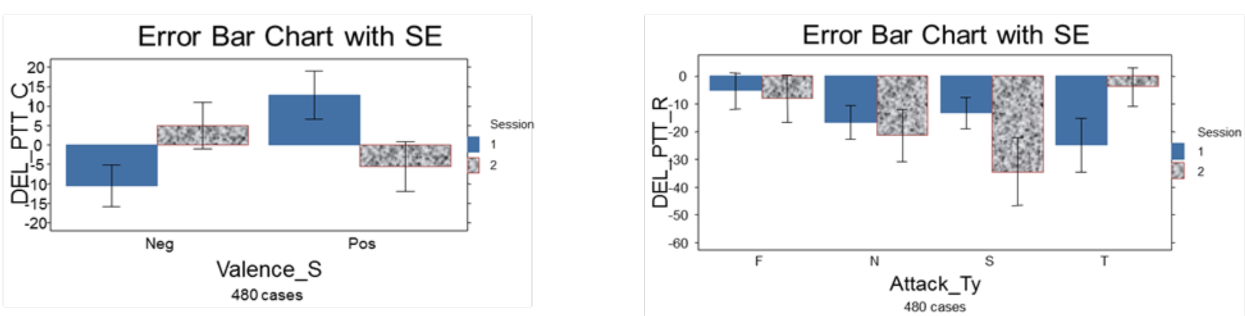


Figure 18. Change in Pulse Transit Time during Video Clip Presentation and Trial

4.3.2 Electro-Dermal Activity (EDA)

Electro-dermal activity during epoch one (EDA_1) was not significantly affected by the independent variables. Electro-dermal activity during epoch two (EDA_2) was significantly affected by attack type and valence of the video clip, both as main effects and an interaction (F(3,87) = 6.84, p < .001), (F(1,29) = 7.03, p < .015), and (F(3,87) 9.16, p < .001). Electro-dermal activity during epochs three (EDA_3) and four (EDA_4) were not significantly affected by the independent variables. These significant effects are depicted in Figure 19. Electro dermal Activity varies with Attack Type and Video Clip Valence.

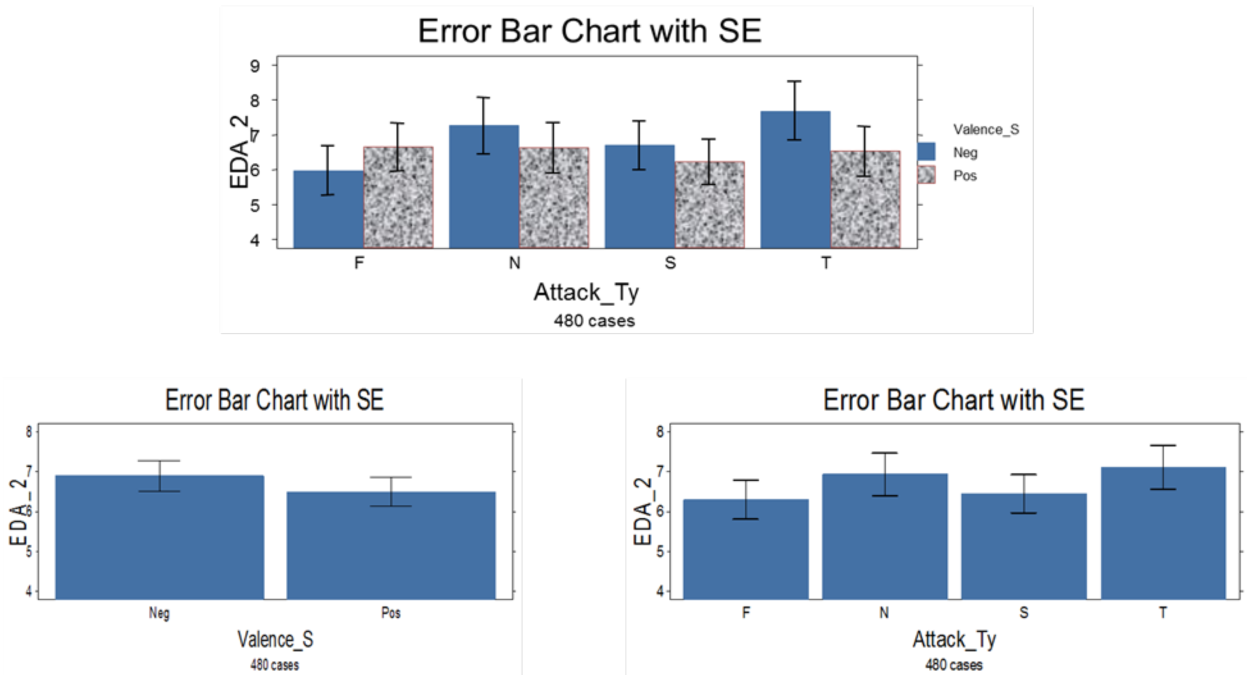


Figure 19. Electro dermal Activity varies with Attack Type and Video Clip Valence

Several measures based on differential Electro-dermal activity were also calculated. The Electro-dermal activity difference between epoch two and epoch one (DEL_EDA_C) was significantly affected by the valence of the video clip and the attack type as main effects (F(3,87) = 7.62, p < .001) and (F(1,29) = 5.12, p < .0351), and the two-way interaction of video clip valence and the attack type (F(3,87) = 8.65, p < .001). The electro-dermal activity difference between epoch four and epoch one (DEL_EDA_R) was significantly affected by the trial session as a main effect (F(1,29) = 14.67, p < .001) and the three-way interaction of attack type, video clip valence, and the trial session (F(1,29) = 2.94, p < .035). The electro-dermal activity difference between epoch four and epoch three (DEL_EDA_T) was not significantly affected by any of the independent variables. These effects are depicted in Figure 20. Change in Electro dermal Activity during Video Clip Presentation and Trial.

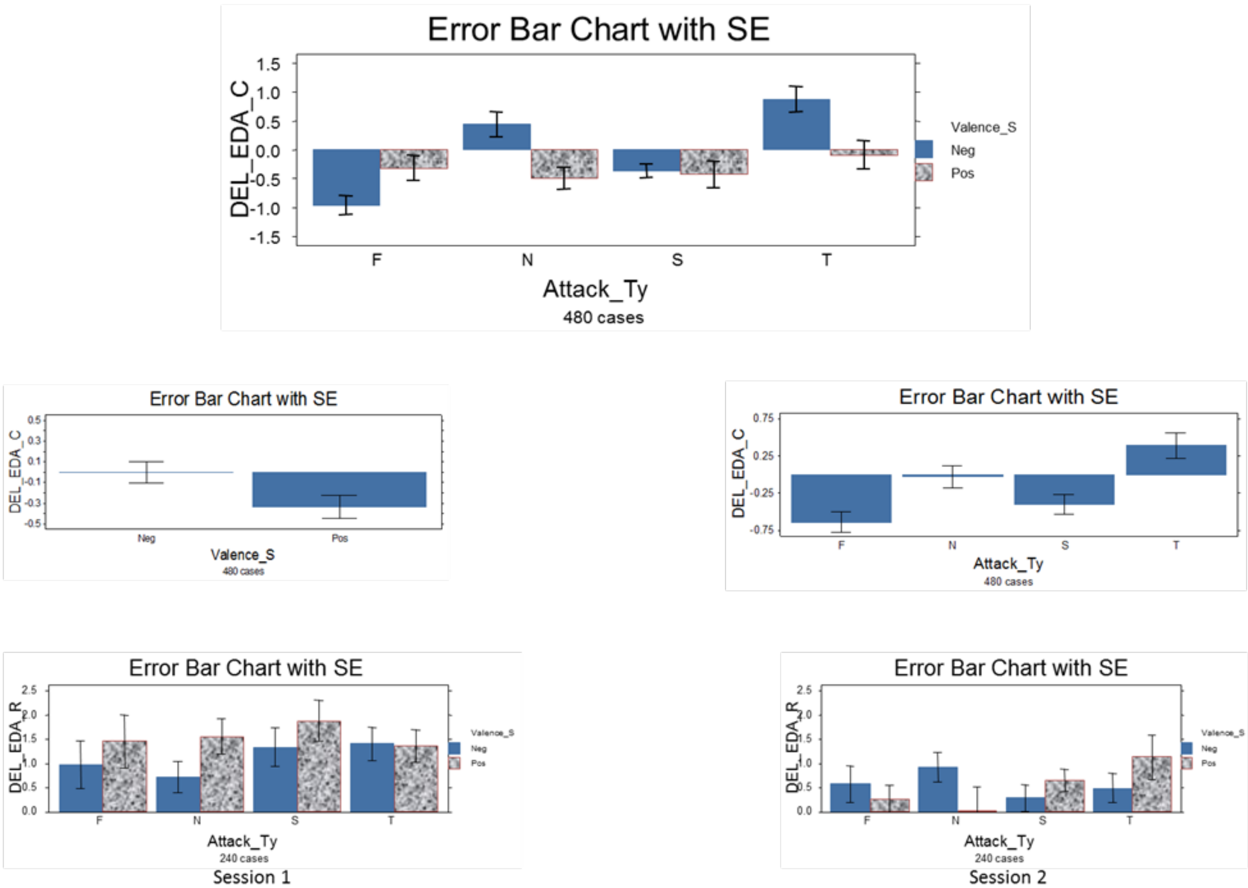


Figure 20. Change in Electro dermal Activity during Video Clip Presentation and Trial

4.4 Subjectively-reported Affect Measures Analyses of Independent Variable Effects

In order to determine how the different attack types influenced affect state from pre to post-task, broken down by session and video valence, an ANOVA was completed on each of the relevant affect measure dependent variables. Pre-task affect was measured after the video clip was presented but prior to task initiation. Post-task affect was measured immediately after the task was completed. The statically significant relationships found between the variables for session, attack type, video valence and the dependent affect measure variables are reported below.

4.4.1 Subjective Affect Measured with Slider Mechanism

The participant's level of arousal before task initiation, as measured with the slider mechanism (AR_AS_Pre) was significantly influenced by the attack type as a main effect ($F(3,87) = 21.66$, $p < .001$) and also was also influenced by a three-way interaction of attack type, valence of the video clip, and the session ($F(3,87) = 2.77$, $p < .05$). The participant's level of arousal after task completion, as measured with the slider mechanism (AR_AS_Post) was significantly influenced by the attack type as a main effect ($F(3,87) = 4.30$, $p < .01$).

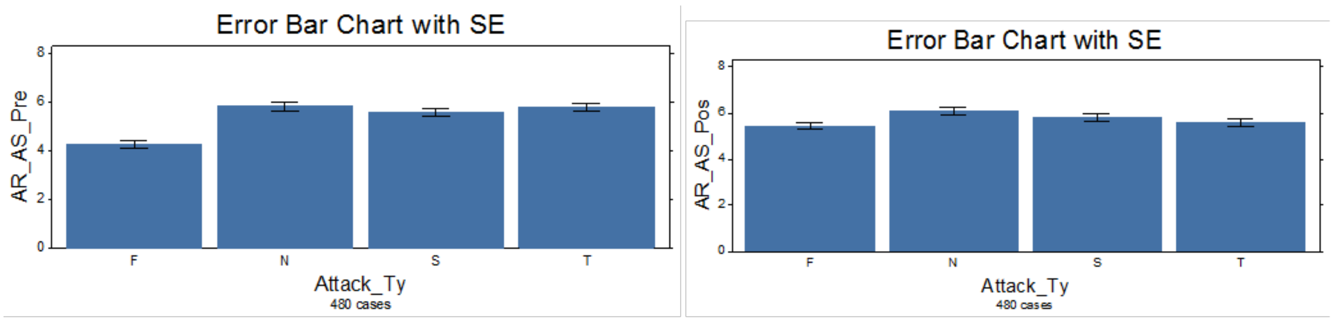


Figure 21. Arousal, Measured with the Slider, Varied with Attack Type

The participant's valence level before task initiation, as measured with the slider mechanism (VA_AS_Pre) was significantly influenced by the attack type as a main effect ($F(3,87) = 2.90$, $p < .04$) and also was also influenced by a two-way interaction of attack type and the valence of the video clip, and the session ($F(3,87) = 2.77$, $p < .05$). The participant's valence level after task completion, as measured with the slider mechanism (VA_AS_Post) was significantly influenced by the attack type as a main effect ($F(3,87) = 29.08$, $p < .0001$). These significant effects are depicted in Figure 22. Valence, Measured with the Slider, Varied with Attack Type.

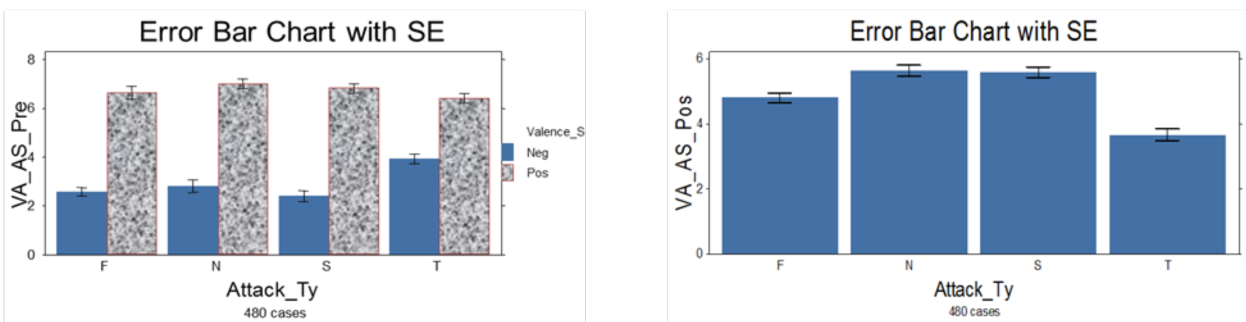


Figure 22. Valence, Measured with the Slider, Varied with Attack Type

4.4.2 Subjective Affect Measured with Grid Instrument

The participant's level of arousal before task initiation, as measured with the Grid Instrument (AR_AG_Pre) was significantly influenced by the attack type as a main effect ($F(3,87) = 23.13$, $p < .001$) and was also influenced significantly by session ($F(1,29) = 6.14$, $p < .02$). The participant's level of arousal after task initiation, as measured with the Grid Instrument (AR_AG_Post) was significantly influenced by the attack type as a main effect ($F(3,87) = 6.86$, $p < .001$). These effects are depicted in Figure 23. Arousal and Valence, Measured with the Affect Grid, Varied with Attack and Video Clip.

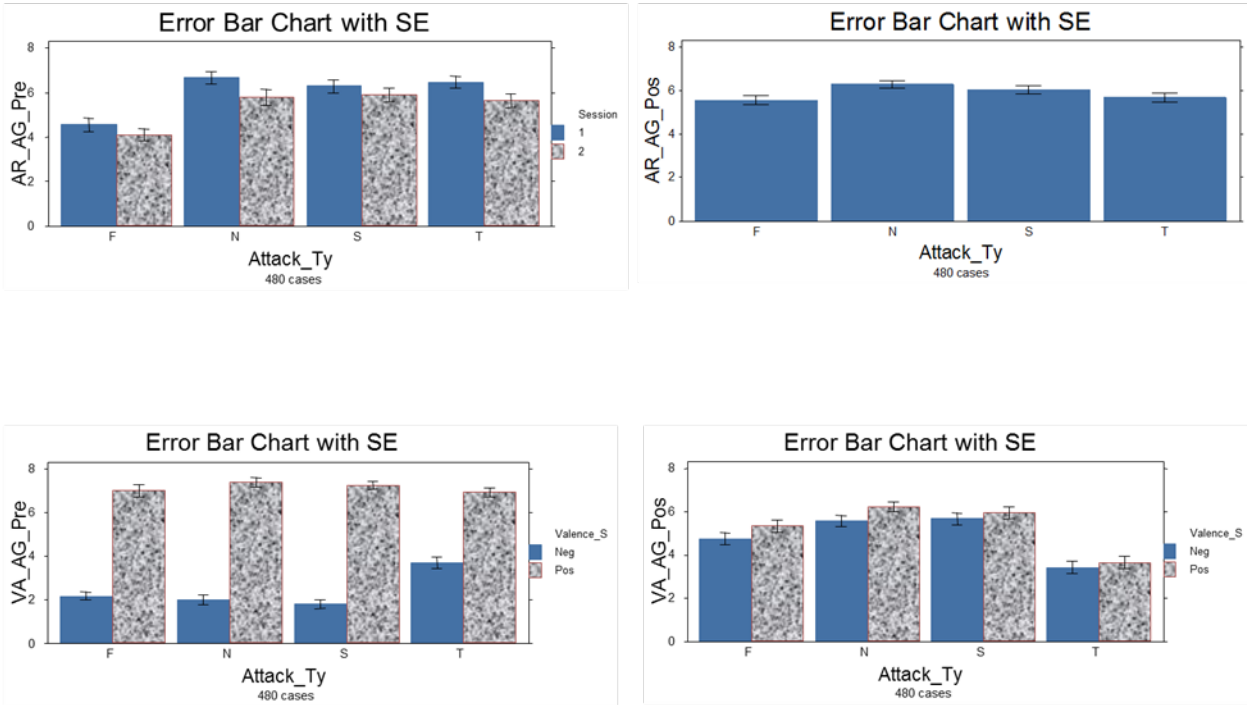


Figure 23. Arousal and Valence, Measured with the Affect Grid, Varied with Attack and Video Clip

The participant's valence level before task initiation, as measured with the Grid Instrument (VA_AG_Pre) was significantly influenced by the attack type as a main effect ($F(3,87) = 5.09$, $p < .003$) as well as the valence of the video clip as a main effect ($F(1,29) = 209.35$, $p < .001$). There also was also a significant two-way interaction of attack type and the valence of the video clip ($F(3,87) = 12.61$, $p < .001$). The participant's valence level after task initiation, as measured with the Grid Instrument (VA_AG_Post) was significantly influenced by the attack type and the valence (see Figure 23. Arousal and Valence, Measured with the Affect Grid, Varied with Attack and Video Clip).

4.4.3 Subjective Affect Measured with Survey Questions

The participant's level of negative affect before task initiation, as measured with PANAS-X-N survey (PNS_N_Pre) was significantly influenced by the attack type as a main effect ($F(3,87) = 9.71$, $p < .001$) and was also influenced significantly by the valence of the video clip ($F(1,29) = 35.96$, $p < .001$). Two significant interactions were present, those being the interaction of attack type and valence of the video clip ($F(3,87) = 14.39$, $p < .001$) and the valence of the video clip and the session ($F(1,29) = 7.81$, $p < .01$). These effects are depicted in Figure 24. PANAS-N Affect Measured Pre and Post Task.

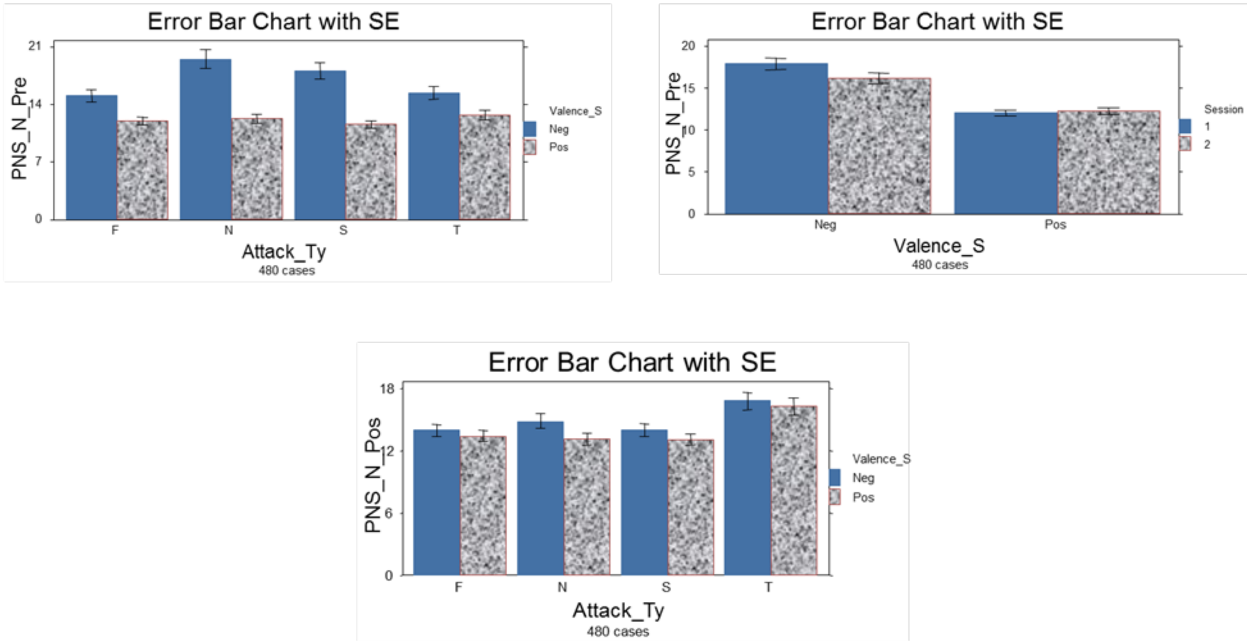


Figure 24. PANAS-N Affect Measured Pre and Post Task

The participant's level of negative affect after task initiation, as measured with the PANAS-X-N survey (PNS_N_Post) was significantly influenced by the attack type as a main effect ($F(3,87) = 17.20$, $p < .001$) and the valence of the video clip ($F(1,29) = 11.00$, $p < .003$). These effects are depicted in Figure 24. PANAS-N Affect Measured Pre and Post Task.

The participant's level of positive affect before task initiation, as measured with PANAS-X-P survey (PNS_P_Pre) was significantly influenced by the attack type as a main effect ($F(3,87) = 13.85$, $p < .001$) and was also influenced significantly by the valence of the video clip ($F(1,29) = 18.22$, $p < .001$) as well as the session ($F(1,29) = 9.74$, $p < .005$). A single two-way significant interaction was present, specifically attack type and valence of the video clip ($F(3,87) = 5.76$, $p < .002$). These effects are depicted in Figure 25. PANAS-P Affect Measured Pre and Post Task.

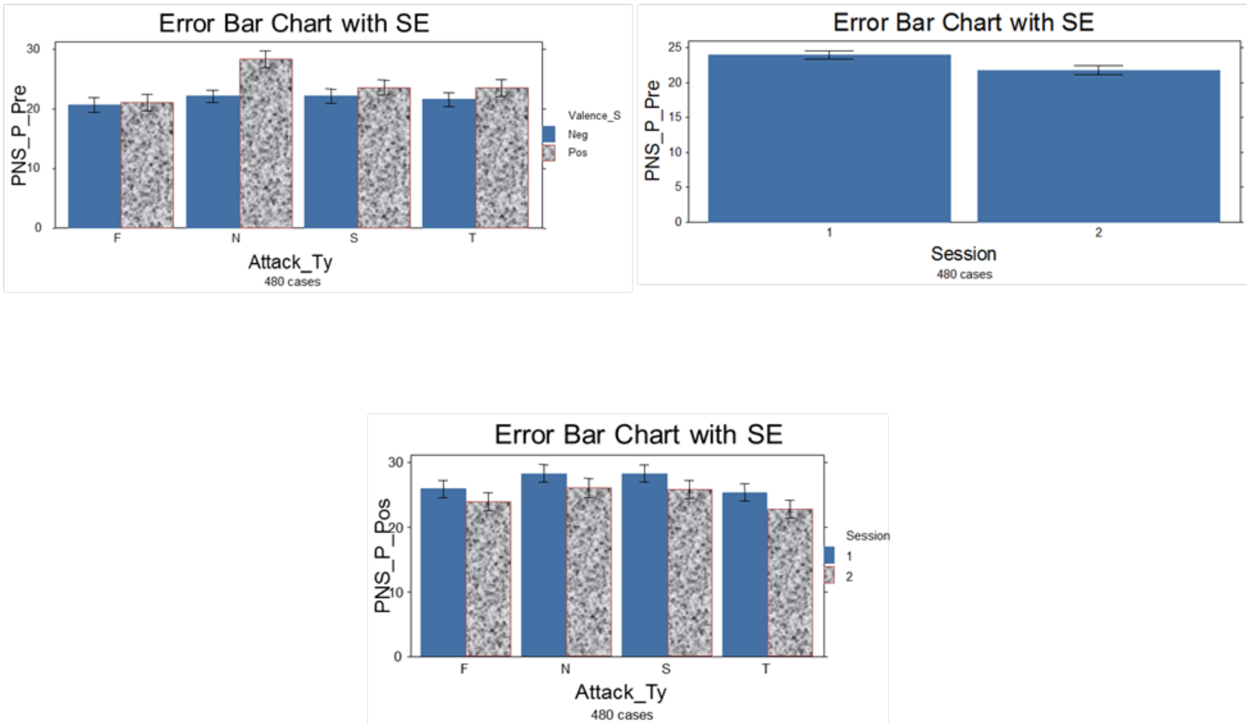


Figure 25. PANAS-P Affect Measured Pre and Post Task

The participant's level of positive affect after task initiation, as measured with the PANAS-X-P survey (PNS_P_Post) was significantly influenced by the attack type as a main effect ($F(3,87) = 11.12$, $p < .001$) and the session ($F(1,29) = 9.47$, $p < .005$). These effects are depicted in Figure 25. PANAS-P Affect Measured Pre and Post Task.

4.5 Attention to System Change/Attack Variations

The age, years of education, and emotional regulation ability (STEM) were not found to be significantly related to whether participants noticed any change or attack in the system during the experimental sequence, given in

Table 7. System Change Recognition group statistics. However, there were differences in cognitive abilities between these two groups, and a main effect for Conscientiousness ($F(1,31) = 5.54$, $p = .025$). There was a main effect for SOC mean subsequent thinking time (time to complete all moves; $F(1,32) = 15.46$, $p < .001$), which was significantly shorter for those who noticed any change or attack in the system ($t(32) = -2.73$, $p = .010$). A significant main effect was not found for SOC mean initial thinking time ($F(1,32) = .540$, $p = .468$), though the group means were significantly different ($t(32) = 2.09$, $p = .045$). Additionally, Choice Reaction Time (CRT) correct latency was significantly shorter for those who noticed any change or attack in the system ($t(32) = 3.52$, $p = .001$), though no main effect was found ($F(1,32) = 3.77$, $p = .061$).

Table 7. System Change Recognition group statistics

Group Statistics

	Notice problem in system?	N	Mean	Std. Deviation	Std. Error Mean
Age	No	11	22.18	6.809	2.053
	Yes	22	25.59	10.404	2.218
Years Higher Education	No	11	14.00	1.949	.588
	Yes	22	14.00	1.662	.354
Extraversion	No	11	.598864	.2254478	.0679751
	Yes	22	.511932	.1837311	.0391716
Agreeableness	No	11	.734091	.1490691	.0449460
	Yes	22	.741477	.1646328	.0350998
Conscientiousness	No	11	.692045	.2056448	.0620042
	Yes	22	.663068	.1387914	.0295904
Emotional Stability	No	11	.571591	.1911389	.0576306
	Yes	22	.544886	.1886930	.0402295
Intellect/Imagination	No	11	.695455	.1552491	.0468094
	Yes	22	.697159	.1813036	.0386541
ERA - MER weighted	No	11	.899713	.0459214	.0138458
	Yes	22	.906936	.0454086	.0096812
ERA - PEC weighted	No	11	.690245	.0910720	.0274592
	Yes	22	.676478	.1229306	.0262089
IED - Stages completed	No	11	8.55	.820	.247
	Yes	23	8.61	.783	.163
IED - total errors	No	11	21.18	16.241	4.897
	Yes	23	19.17	13.670	2.850
SOC - mean initial thinking time	No	11	5684.3182	5190.93822	1565.12676
	Yes	23	10342.0761	6461.87801	1347.39471
SOC - mean subsequent thinking time	No	11	2005.7145	2334.44784	703.86251
	Yes	23	563.6070	738.17630	153.92040
SOC - problems solved in min moves	No	11	7.82	2.523	.761
	Yes	23	8.96	1.522	.317
CRT - mean correct latency	No	11	367.407273	58.4714623	17.6298092
	Yes	23	309.493043	37.1714241	7.7507777
CRT - max correct latency	No	11	634.27	145.138	43.761
	Yes	23	612.17	253.907	52.943
AVERAGE Score	No	11	9935.364545	13132.4286412	3959.5762172
	Yes	23	14491.400435	17979.3994632	3748.9639442

Table 8. System Change Recognition Group Differences

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Conscientiousness	5.543	.025*	.480	31	.634	.0289773	.0603298
SOC - mean initial thinking time	.540	.468	-2.085	32	.045*	-4657.75791	2233.71838
SOC - mean subsequent thinking time	15.461	.000*	2.729	32	.010*	1442.10759	528.40140
CRT - mean correct latency	3.766	.061	3.516	32	.001*	57.9142292	16.4693417

*Indicated statically significance at p<.05 level

4.6 Effects of Independent Variables on Subjective Workload

Subjective workload was measured using the NASA TLX instrument. The effects of the independent variables, attack type, valence state, and session, were investigated using repeated-measures ANOVA and indicated significant effects did exist. Specifically attack type and session affected the NASA TLX Performance Rating Scale (TLX_Perf) ($F(3,87) = 23.57$, $p < .001$) and ($F(1,29) = 11.52$, $p < .002$). Attack type and session also affected the NASA TLX Effort Rating Scale (TLX_Eff) ($F(3,87) = 7.92$, $p < .001$) and ($F(1,29) = 7.90$, $p < .001$). Only attack type affected the NASA TLX Frustration Rating Scale (TLX_Frus) ($F(3,87) = 34.93$, $p < .001$). These significant effects are depicted in Figure 26. Task Load Index of Performance, Efforts, and Frustration.

Overall, the participant's subjective workload, as measured with the NASA TLX, appeared to increase during the trials in which the manual tracking task was attacked. Session, a measure of time in the trial, appeared to affect the mental workload. Specifically, the perceived temporal and mental demand appeared to be reduced overall. Here again, attack on the tracking task appeared to induce the largest physical demand, mental demand and temporal demands relative to the other attack conditions.

Attacks on the tracking task induced increased levels of frustration relative to the other attack conditions. In addition, attacks on the tracking task appeared to reduce the subjectively reported performance but induced an increase in subjectively reported effort needed to complete the task.

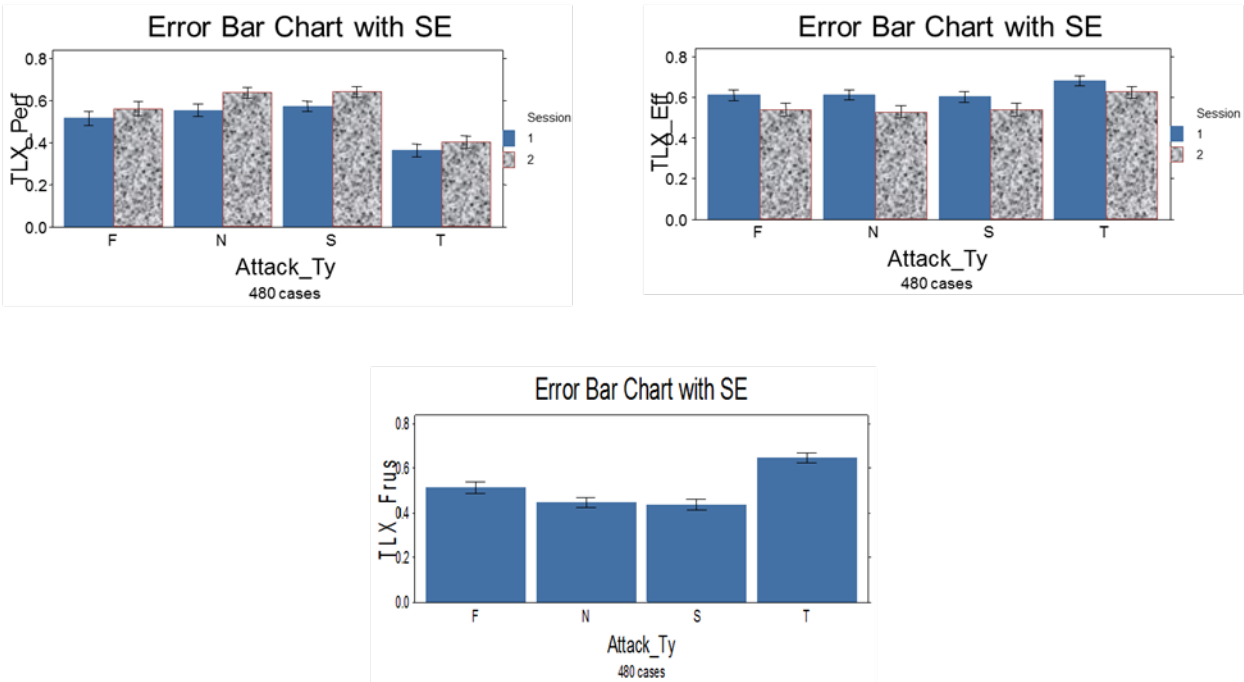


Figure 26. Task Load Index of Performance, Efforts, and Frustration

Attack type and session affected the NASA TLX Temporal Demand metric (TLX_TD) ($F(3,87) = 15.00$, $p < .001$) and ($F(1,29) = 5.56$, $p < .03$). The NASA TLX Mental Demand metric (TLX_MD) was significantly affected by attack type and session ($F(3,87) = 12.97$, $p < .001$) and ($F(1,29) = 6.17$, $p < .02$). The NASA TLX Physical Demand metric (TLX_PD) was significantly affected by attack type ($F(3,87) = 6.93$, $p < .001$). These significant effects are depicted in Figure 27. Task Load Index of Mental Demand, Temporal Demand, and Physical Demand.

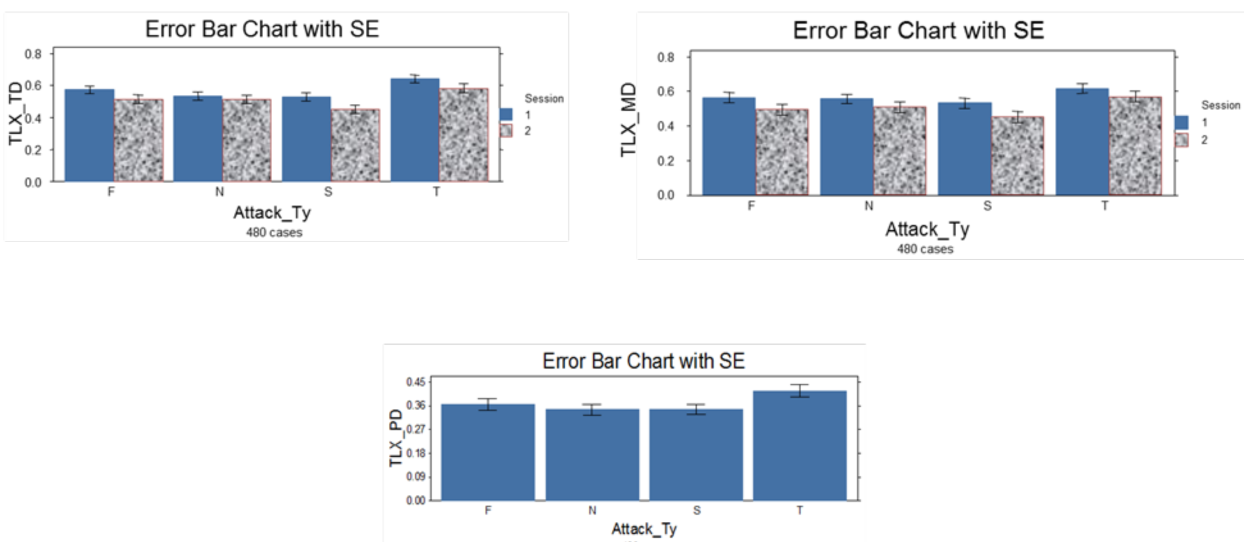


Figure 27. Task Load Index of Mental Demand, Temporal Demand, and Physical Demand

5.0 CONCLUSIONS

The purpose of this study was to systematically examine emotional responses to information manipulation of key task parameters during task performance following emotional stimulation through the presentation of video segments. The effect of emotions on situational awareness (as reflected by a performance score) under simulated cyber attack was analyzed. By examining participants' responses to the simulated cyber attacks, we attempted to determine to what extent an individual's traits, such as personality, cognitive ability, and emotional responsiveness were related to one's vulnerability, as reflected by reduced task performance and the ability to adapt and properly respond to the attacks.

The results from this study are important for the Air Force in a number of ways. We have found that a few basic cognitive tests, such as choice reaction time, stockings of Cambridge, and the Conscientiousness component of the big five personality constructs can predict whether a person will notice information manipulations in their system. This is important for both offensive targeting and defensive personnel vectoring purposes. This study has also found that the five factor model of personality, emotional regulation ability, and certain attacks interact to mediate emotional state. This makes it possible to actually predict an emotional state given the person's personality, emotional regulation ability and the specific information attack type desired.

This study has also determined that significant interactions exist among the variables for task performance, attack type, video valence, gender, age, cognitive ability, and emotional management ability. This is important because it has been unclear and unstudied previously whether emotional state or emotional regulation ability actually influenced basic task performance in an emotional environment (such as in the real world), which evidence from this study has shown to be the case. In fact, negative affect states appear to be more beneficial for task performance in an affective environment than positive affect states, which is interesting. Perhaps this effect is due to the focusing aspect of the negative clips and negative affect states, which focuses the person on the task at hand, or makes the person take the task more seriously than when in a positive state. Effort put into situational awareness and hence task performance is apparently influenced by a person's emotional state. This could be useful to the Air Force in crafting certain influence operations in order to calm the target audience, or lull them into a positive affect state or at least avoid negative states when the desire is to decrement the target's task performance.

This section discusses the empirical results reported in Section Four of this report, the implications of those results, and conclusions drawn from the results. The research questions to be answered were:

1. To what extent does performance of a complex task differ when affected by manipulation of underlying information elements?

2. To what extent are an individual's traits associated with differing abilities across individuals to "fight through" an informational attack?

3. Is an individual’s cognitive state associated with differing levels of coping with additional demands created by informational attack?

4. Can an individual’s physiological state accurately reflect differences in emotional state caused by informational attack?

5.1 Question 1 - To what extent does performance of a complex task differ when affected by manipulation of underlying information elements and can an affective computing technique mitigate these effects?

It is clear from the results that task performance can be degraded by manipulating key task informational elements. The level of peroformance demonstrates a significant variation across the tasks used in the study. In addition, the performance degradation appears to be somewhat dependent on the dynamics of the task with the more dynamic task experiencing the largest reduction and a slower-moving task showing a much smaller level of reduction. There could be alternative rationale that would affect the level of performance degradation, such as task placement (the larger degradation being associated with the more centrally located task display) or the task under control of the joystick versus keyboard-only input. It should be noted that after the complete set of trials had been completed, approximately 66% of the participants reported noticing when the informational attack had occurred and approximately 33% did not report noticing that an informational attack had occurred. Performance degradation did change over time as well. Session 2 performance improved over performance in Session 1. This could have been due to being more familiar with the tasks and attacks themselves, or the sensitivity to the affect-inducing stimuli had changed, or that there was an induced affect change over the duration of the sixteen trials. The information attack used in this study was a persistently occurring attack. The participant was not able to reset their system once the presence of the attack was noticed but had to continuously adapt to the errors induced by the attack. Perhaps a different result would occur if the participant was able to correct a single occurrence of the attack allowing for the most obvious attack to be counted more quickly.

The valence of the video clip shown directly before execution of the task did change the participant’s affect but was not a significant factor in the performance metric. There was a multiple-factor interaction that was significant that involved the valence of the video clip. It is possible this mitigation did occur but was a function of the task itself and also was a function of time. It is clear from the data that the overall performance of the participants increased when their subjectively reported valence was negative relative to performance when their reported valence was positive.

5.2 Question 2 - To what extent are an individual’s traits associated with differing abilities across individuals to “fight through” an informational attack?

Several individual traits were measured during this study, including cognitive abilities, emotional regulation and management, the big-five personality elements, and traditional demographics. Several of the measured cognitive traits are negatively correlated with the participant’s ability to perform the task during the informational attack. The numbers of, and time of, solved problems from two of the cognitive abilities tests support an association of performance degradation differences across Attack Type and Session indicating a stronger effect during attacks creating the largest performance degradation. However, these relationships demonstrate significance in 3-way and 4-way interactions with the two independent variables and Session indicating that the relationships are likely extremely complex and time dependent. To further illuminate this point, the cognitive trait measures were correlated with combination of the performance-based dependent measures and shown in Appendix J through N. Several interesting associations are documented in the appendices worthy of further research to fully understand their implications.

5.3 Question 3 - Is an individual's cognitive state associated with differing levels of coping with additional demands created by informational attack?

The participant's initial affect did not demonstrate an association with performance changes but as affect was manipulated during the experiment, differences in performance associated with cognitive state were measurable. The participant's initial cognitive state, called their cognitive state baseline, in this study, was measured with subjective reporting, using a mechanical slider, and reported graphically using an affect grid. None of these measurement techniques provided data that supported a significant relative performance score. During the experiment, the participant's affect was measured both before, and after, performance of the task. The participant's affect after performance of the task was significantly affected by the Attack Type with the two most difficult Attack Types being associated with slightly lower arousal levels and more negative valence levels. Curiously, the affect state before performance of the task also produced arousal and valence level differences even though the attack had not yet occurred during that trial when that measure was taken. This effect was observed in the subjective measures of affect as well as some of the physiological data. Ordering was tested and did not support the cause of this effect. Several explanations are possible.

The first being that the affect measured before performance of the task is not totally independent of the previous trial and the persistence of the affect is creating carry over from trial to trial. The second possible explanation might be that there is an emotional anticipation being measured. It has been shown in the literature that anticipation of a stressful even can product an emotional response before the emotional event occurs in time and that anticipation may be what is being measured. The fact that the effect shows up in several measures supports the speculation that the effect is not a statistical anomaly and worth further research.

Session was a factor in several of the affect state measures either as a man effect or as a factor in an interaction. In general, it was demonstrated that affect in Session 2 was reduced rather than that measured in Session 1. This may indicate some desensitization from the participant to the video clip stimuli as well as developing coping mechanisms for the information attack manipulations. This is supported with increased performance in Session 2 relative to Session 1.

It can be seen from these figures that the fuel attack had the largest incremental effect on arousal, while other attacks marginally changed arousal levels between the two valence induction clip types.

The participant valence was initially altered pre-task in the direction of the respective clip valence type, followed by the task and attack type which interacted to evoke the post-task affect state. It is clear that valence recovered toward the subject baseline during the task in both positive and negative clip valence conditions, and in general across attack types. Valence after positive conditional attacks was less than pre-task, meaning the task caused a negative change in valence after positive clips. Valence after negative conditional attacks was greater than pre-task, meaning the task caused a positive change in valence after negative clips. Essentially, the task brought the participant's valence level back toward the participant baseline state. The tracking attack in positive valence conditions had a larger 'return' effect, suggesting that this attack was the most unpleasant attack type. During negative conditions, there was essentially no 'return' effect, suggesting that the participant's valence level was already very unpleasant due to the negative clip, and that the tracking attack merely kept participants in this unpleasant state. Session also caused a difference in the degree of valence change from pre to post task affect. Session 1 mean valence changes from pre to post-task were essentially zero, while Session 2's mean valence changes from pre to post-task tended to be positive, though very small.

Positive affect appears to increase relatively similarly between valence conditions from pre to post-task. This means the task itself caused general positive affect to increase similarly across attacks, except the No Attack condition which showed a very small change from pre-task affect state after positive clips. The tracking attack had a similar effect on affect state as that which was reflected in the affect grid valence measure, being that it had a detrimental effect on positive affect and an incremental effect on negative affect.

Overall, it can be concluded that the task itself moderated affect state and brought it back toward the participant baseline affect state. The tracking attack caused the most change in affect state, being that it had the most negative effect, followed by the fuel attack.

5.4 Question 4 - Can an individual's physiological state accurately reflect differences in emotional state caused by informational attack?

The physiological measures do reflect emotional state but in a relative complex fashion. Physiological measures were significantly affected by the independent variables as well as Session during this study. Heart rate measured after video clip presentation, and a change in heart rate measured across the video clip, was affected by the valence of the video clip with negative clips reducing heart rate relative to positive video clip presentation. Overall heart rate was reduced significantly when the negative video clips were shown relative to the positive video clip trials. Additionally, overall heart rate in Session 2 was lower than Session 1. Heart rate measured during the final 12 seconds of the video clip, and across the video clip presentation time, was significantly affected by the Attack Type. However, the attack itself had not yet begun when this heart rate measure was collected. As these responses are similar in pattern to subjectively reported affect state, the causes may be similar to a similar pattern observed in the affect state data and may be an anticipatory response.

Pulse transit times, a derived metric that is associated with negative changes in blood pressure, supported elevation (lower blood pressure) when positive valence video clips were presented and reduced (higher blood pressure) when negative valence video clips were presented. This effect, while still present, was greatly reduced in Session 2 relative to Session 1. Perhaps the cause of this desensitization is that the same video clips used in Session 1 were re-used in Session 2 in a differing order. Pulse Transit Times measured across trials during Session 2 support positive correlation with overall performance, in that as performance was reduced, so were the participant's Pulse Transit Time. This, in turn, would indicate a rise in blood pressure as performance was reduced and as the overall task was made more difficult and frustration built.

The simulated information attacks on the tracking task were indicative of an increase to the Electro dermal Activity (EDA) relative to the other simulated attack types used in this study during Session 2 but not during Session 1. This effect is most clearly seen after the video clip presentation with the presentation of negative valence clips producing the highest EDA values. The change in EDA during the presentation of the video clip is affected by the attack type which is interesting as the attack for that trial has not yet occurred. This pattern is apparent in several of the metrics used in this study and it could be speculated that it may be associated with anticipation of the task with attack that is about to start for the participant, or perhaps a persistent emotional state created by the previous task with attack resulting in a carryover effect.

5.5 Miscellaneous Relevant Analyses

5.5.1 Visual Inspection of Video Clip Valence:

Results from the analyses of performance suggest that the presentation of negative valence film clips reduces the degradation of performance induced by the simulated information attacks. These analyses also suggested that negative clips were more effective at inducing the target affect state than positive clips. This may be the true reason for the difference between different valence condition scores in the first session; not purely due to the valence of the clip, but due to the efficacy of the affect induction clip. One could speculate that in theory, positive and negative valence stimuli of equal valence induction efficacy may have the same magnitude and direction of effect on task performance when compared to a neutral or no stimulus control condition. However, it may be difficult, if not impossible to achieve a perfect balance between a pair of video clips (one positive and one negative). In this study, there was no attempt to balance the content of the video stimuli, only the number of positive and negative clips utilized. There is no evidence in this study to support observable differences in effects due to arousal differences under positive or negative valence conditions.

It is possible that the induction of the target affect state during the negative valence conditions was more effective than during the positive conditions. Target affect state induction for Session 2 was not as effective as in Session 1, suggesting that seeing the clips a second time does not induce affect states to the same degree. Both the Affect Grid and Affect Slider Bar measures detected higher arousal for Clip 3 in session 1 than session 2. However, only the Affect Grid measure detected a difference between arousal levels for positive clips between sessions, with session 1 clips rating higher on arousal than session 2 clips. This discrepancy would suggest a measurement imperfection between the grid and slider measures, when they should theoretically report the same values. The continuous affect grid supportted detection of significant differences between positive and negative clips on valence, but not arousal, and between sessions on valence only between clips 1 and 8. Given this presence, it seems reasonable to conclude that positive conditions induced slightly higher levels of arousal in participants in the first session than second session, but there was no apparent difference in arousal levels between positive and negative clips, and that the target affect states were effectively induced differentially.

Visually examining graphs for general positive/negative affect ratings relative to the subject baselines; different clips had somewhat different induction effects. This is not too surprising. Negative clips 5 and 8 appear to be rated significantly higher for negative affect than all the other clips, whereas the other two negative clips (6 & 7) are only marginally higher on negative affect than the positive clips (1-4). Additionally, there is very little difference between clips 2-8 on positive affect, except clip 1 which appears to produce an increased affect level than the rest.

There may have been individual differences in induced valence between the eight clips. Because these clips have induced differing levels of valence and general affect within the clip-type group (positive vs. negative), this could bias the performance data when comparing attack types between positive and negative conditions. Although the eight treatment conditions were counterbalanced in their order of presentation to the participants, the video clips were paired across attack types (positive and negative), but were not randomly assigned across the attack types. For example, Clips 1 & 5 was only paired with No Attack, Clips 2 & 6 was only paired with the Tracking Attack, Clips 3 & 7 was only paired with the Fuel Attack, and Clips 4 & 8 was only paired with the Score Display Attack. It is not apparent that this allocation influenced the results. However, the presumption that all positive and negative clips would induce similarly divergent ratings of affect may not be factual in this study. The magnitude of this potential effect of this is not known.

5.5.2 Session Differences Analysis:

Additionally, the conditional positive affect divergence effect was larger in magnitude in the second session ($t(33) = -4.26$, $p < .001$) than the first session ($t(33) = -3.14$, $p = .004$), while the conditional negative affect divergence effect was smaller in magnitude in the second session ($t(33) = 5.65$, $p < .001$) than the first session ($t(33) = 6.10$, $p < .001$). The positive clip difference between sessions on positive affect ($t(33) = -3.91$, $p < .001$), negative clip difference between sessions on positive affect ($t(33) = -3.76$, $p < .001$), and negative clip difference between sessions on negative affect ($t(33) = -2.62$, $p = .013$) were all significant. Negative affect mean ratings were not significantly differently between sessions for positive clips ($t(33) = .32$, $p = .751$).

5.6 Future Research

The study of affect's role in decision making and situation awareness is still in its infancy. This study has uncovered several interesting associations between information manipulations, performance degradation, and state and trait influences. However, there is still much to be understood. Maturation of sensor technology is needed to enable all of the physiological and behavioral measures to be obtained remotely. Facial expression, as measured by video should be explored for its accuracy and temporal characteristics. An experimental technique should be developed and tested to differentiate anticipatory affect response from carry-over effects raising the independence of dependent variables used in repeated measure designs.

This study utilized one participant at a time. Earlier research anecdotally indicated emotional response to information attack when operating in teams. Studying teams would be a worthy research area. Additionally, it would useful to understand how training may enhance, or reduce, the effectiveness of individual and teams operating in this environment. And finally, but very importantly, the characteristics of task and information manipulation techniques should be fully mapped against their associated contributions to performance degradation as well as mental workload, situation awareness, and decision-making impacts. In this way, better defense of information attack can be developed and the potential for information attack on affect can be operationalized in the future.

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APPENDIX A. FILM RESPONSE QUESTIONNAIRE

Had you seen this film before? ____ No ____ Yes

Did you close your eyes or look away during this scene? ____ No ____ Yes

APPENDIX B. DEMOGRAPHICS QUESTIONNAIRE

1) AGE: ______

2) SEX: M / F

3) Military member? Y / N

4) Higher Education level completed (please circle the highest completed)

- None
- Freshman
- Sophomore
- Junior
- Senior or above

5) Current Occupation: ________________________________

6) Do you require the use of glasses or contacts? Y / N

APPENDIX C. SITUATIONAL TEST OF EMOTION MANAGEMENT (STEM)

Instructions (multiple-choice form)

In this test, you will be presented with a few brief details about an emotional situation, and asked to choose from four responses the most effective course of action to manage both the emotions the person is feeling and the problems they face in that situation.

Although more than one course of action might be acceptable, you are asked to choose what you think the most effective response for that person in that situation would be.

Remember, you are not necessarily choosing what you would do, or the nicest thing to do, but choosing the most effective response for that situation.

Note: items marked with an asterisk were excluded from Study 2. Numbers in parentheses refer to expert scoring weights: (1) the mean rating of experts, and (2) the proportion of experts selecting that option.

1. Lee's workmate fails to deliver an important piece of information on time, causing Lee to fall behind schedule also. *What action would be the most effective for Lee?*
(a) Work harder to compensate. (3.2/0)
(b) Get angry with the workmate. (2.6/0)
(c) Explain the urgency of the situation to the workmate. (5.2/1.000)
(d) Never rely on that workmate again. (2.4/0)

2. Rhea has left her job to be a full-time mother, which she loves, but she misses the company and companionship of her workmates. *What action would be the most effective for Rhea?*
(a) Enjoy being a full-time mom. (2.8/0)
(b) Try to see her old workmates socially, inviting them out. (4.4/.250)
(c) Join a playgroup or social group of new mothers. (4.8/.667)
(d) See if she can find part time work. (2.8/.083)

3. Pete has specific skills that his workmates do not and he feels that his workload is higher because of it. *What action would be the most effective for Pete?*
(a) Speak to his boss about this. (4.6/.833)
(b) Start looking for a new job. (2.4/0)
(c) Be very proud of his unique skills. (3.2/.083)
(d) Speak to his workmates about this. (3.8/.083)

* 4. Mario is showing Min, a new employee, how the system works. Mario's boss walks by and announces Mario is wrong about several points, as changes have been made. Mario gets on well with his boss, although they don't normally have much to do with each other. *What action would be the most effective for Mario?*
(a) Make a joke to Min, explaining he didn't know about the changes. (4.0/.333)
(b) Not worry about it, just ignore the interruption. (2.2/0)
(c) Learn the new changes. (4.6/.417)

(d) Tell the boss that such criticism was inappropriate. (3.2/.250)

5. Wai-Hin and Connie have shared an office for years but Wai-Hin gets a new job and Connie loses contact with her. *What action would be the most effective for Connie?*
(a) Just accept that she is gone and the friendship is over. (2.6/0)
(b) Ring Wai-Hin an ask her out for lunch or coffee to catch up. (4.6/0)
(c) Contact Wai-Hin and arrange to catch up but also make friends with her replacement. (5.6/.917)
(d) Spend time getting to know the other people in the office, and strike up new friendships. (4.4/.083)

* 6. Martina is accepted for a highly sought after contract, but has to fly to the location. Martina has a phobia of flying. *What action would be the most effective for Martina?*
(a) See a doctor about this. (4.4/.750)
(b) Don't go to the location. (1.4/0)
(c) Just get through it. (2.8/0)
(d) Find alternative travel arrangements. (3.0/.250)

7. Manual is only a few years from retirement when he finds out his position will no longer exist, although he will still have a job with a less prestigious role. *What action would be the most effective for Manual?*
(a) Carefully consider his options and discuss it with his family. (5.0/.750)
(b) Talk to his boss or the management about it. (4.4/.250)
(c) Accept the situation, but still feel bitter about it. (2.0/0)
(d) Walk out of that job. (1.0/0)

8. Alan helps Trudy, a peer he works with occasionally, with a difficult task. Trudy complains that Alan's work isn't very good, and Alan responds that Trudy should be grateful he is doing her a favor. They argue. *What action would be the most effective for Alan?*
(a) Stop helping Trudy and don't help her again. (1.8/.167)
(b) Try harder to help appropriately. (2.8/.083)
(c) Apologize to Trudy. (2.8/.083)
(d) Diffuse the argument by asking for advice. (4.6/.667)

9. Surbhi starts a new job where he doesn't know anyone and finds that no one is particularly friendly. *What action would be the most effective for Surbhi?*
(a) Have fun with his friends outside of work hours. (3.8/0)
(b) Concentrate on doing his work well at the new job. (4.0/.167)
(c) Make an effort to talk to people and be friendly himself. (5.4/.833)
(d) Leave the job and find one with a better environment. (2.4/0)

10. Darla is nervous about presenting her work to a group of seniors who might not understand it, as they don't know much about her area. *What action would be the most effective for Darla?*
(a) Be positive and confident, knowing it will go well. (4.0/0)
(b) Just give the presentation. (2.8/0)
(c) Work on her presentation, simplifying the explanations. (5.2/.667)

(d) Practice presenting to laypeople such as friends or family. (5.2/.333)

11. Andre moves away from the city his friends and family are in. He finds his friends make less effort to keep in contact than he thought they would. *What action would be the most effective for Andre?*
(a) Try to adjust to life in the new city by joining clubs and activities there. (4.8/0)
(b) He should make the effort to contact them, but also try to meet people in his new city. (5.6/1.000)
(c) Let go of his old friends, who have shown themselves to be unreliable. (2.2/0)
(d) Tell his friends he is disappointed in them for not contacting him. (3.2/0)

12. Helga's team has been performing very well. They receive poor-quality work from another team that they must incorporate into their own project. *What action would be the most effective for Helga?*
(a) Don't worry about it. (1.8/0)
(b) Tell the other team they must re-do their work. (4.6/.417)
(c) Tell the project manager about the situation. (4.6/.583)
(d) Re-do the other team's work to get it up to scratch. (2.6/0)

13. Clayton has been overseas for a long time and returns to visit his family. So much has changed that Clayton feels left out. *What action would be the most effective for Clayton?*
(a) Nothing – it will sort itself out soon enough. (2.6/0)
(b) Tell his family he feels left out. (4.4/.167)
(c) Spend time listening and getting involved again. (5.4/.750)
(d) Reflect that relationships can change with time. (4.6/.083)

* 14. Katerina takes a long time to set the DVD timer. With the family watching, her sister says "You idiot, you're doing it all wrong, can't you work the video?" Katerina is quite close to her sister and family. *What action would be the most effective for Katerina?*
(a) Ignore her sister and keep at the task. (4.0/.167)
(b) Get her sister to help or to do it. (3.6/.667)
(c) Tell her sister she is being mean. (3.6/.167)
(d) Never work appliances in front of her sister or family again. (1.6/0)

* 15. Benjiro's parents are in their late 80s and living interstate in a house by themselves. He is worried that they need some help but they angrily deny it any time he brings up the subject. *What action would be the most effective for Benjiro?*
(a) Visit frequently and get others to check on them. (4.4/.667)
(b) Believe his parents' claims that they are fine. (3.0/.167)
(c) Keep telling his parents his concerns, stressing their importance. (4.4/.167)
(d) Force his parents to move into a home. (1.4/0)

* 16. Max prides himself on his work being of the highest quality. On a joint project, other people do a lousy job, assuming that Max will fix their mistakes. *What action would be the most effective for Max?*
(a) Forget about it. (1.4/0)

(b) Confront the others, and tell them they must fix their mistakes. (4.4/.750)
(c) Tell the project manager about the situation. (4.0/.250)
(d) Fix the mistakes. (2.4/0)

17. Daniel has been accepted for a prestigious position in a different country from his family, who he is close to. He and his wife decide it is worth relocating. *What action would be the most effective for Daniel?*
(a) Realize he shouldn't have applied for the job if he didn't want to leave. (1.4/0)
(b) Set up a system for staying in touch, like weekly phone calls or emails. (5.0/.833)
(c) Think about the great opportunities this change offers. (4.8/.167)
(d) Don't take the position. (1.2/0)

18. A junior employee making routine adjustments to some of Teo's equipment accuses Teo of causing the equipment malfunction. *What action would be the most effective for Teo?*
(a) Reprimand the employee for making such accusations. (2.0/0)
(b) Ignore the accusation, it is not important. (2.6/.500)
(c) Explain that malfunctions were not his fault. (3.4/.500)
(d) Learn more about using the equipment so that it doesn't break. (4.8/0)

19. Mei Ling answers the phone and hears that close relatives are in hospital critically ill. *What action would be the most effective for Mei Ling?*
(a) Let herself cry and express emotion for as long as she feels like. (4.4/.083)
(b) Speak to other family to calm herself and find out what is happening, then visit the hospital. (5.4/.917)
(c) There is nothing she can do. (1.4/0)
(d) Visit the hospital and ask staff about their condition. (4.8/0)

* 20. The woman who relieves Celia at the end of her shift is twenty minutes late without excuse or apology. *What action would be the most effective for Celia?*
(a) Forget about it unless it happens again. (2.2/.167)
(b) Tell the boss about it. (2.6/.083)
(c) Ask for an explanation of her lateness. (4.6/.583)
(d) Tell her that this is unacceptable. (3.6/.167)

21. Upon entering full-time study, Vincent cannot afford the time or money he used to spend on water-polo training, which he was quite good at. Although he enjoys full-time study, he misses training. *What action would be the most effective for Vincent?*
(a) Concentrate on studying hard, to pass his course. (3.4/0)
(b) See if there is a local league or a less expensive and less time-consuming sport. (5.0/.667)
(c) Think deeply about whether sport or study is more important to him. (3.0/.083)
(d) Find out about sporting scholarships or bursaries. (5.0/.250)

* 22. Evan's housemate cooked food late at night and left a huge mess in the kitchen that Evan discovered at breakfast. *What action would be the most effective for Evan?*
(a) Tell his housemate to clean up the mess. (4.4/.250)
(b) Ask his housemate that this not happen again. (4.6/.583)

(c) Clean up the mess himself. (2.0/0)
(d) Assume that the housemate will clean it later. (3.2/.167)

23. Greg has just gone back to university after a lapse of several years. He is surrounded by younger students who seem very confident about their ability and he is unsure whether he can compete with them. *What action would be the most effective for Greg?*
(a) Focus on his life outside the university. (2.0/0)
(b) Study hard and attend all lectures. (4.8/.250)
(c) Talk to others in his situation. (5.4/.750)
(d) Realize he is better than the younger students as he has more life experience. (2.8/0)

* 24. Gloria's housemates never buy essential non-food items when they are running low, relying on Gloria to buy them, which she resents. They know each other reasonably well, but have not yet discussed financial issues. *What action would be the most effective for Gloria?*
(a) Don't buy the items. (2.0/0)
(b) Introduce a new system for grocery shopping and sharing costs. (5.0/.333)
(c) Tell her housemates she has a problem with this. (4.6/.667)
(d) Hide her own personal store of items from the others. (2.6/0)

25. Shona has not spoken to her nephew for months, whereas when he was younger they were very close. She rings him but he can only talk for five minutes. *What action would be the most effective for Shona?*
(a) Realize that he is growing up and might not want to spend so much time with his family any more. (4.2/0)
(b) Make plans to drop by and visit him in person and have a good chat. (4.0/.250)
(c) Understand that relationships change, but keep calling him from time to time. (4.8/.750)
(d) Be upset about it, but realize there is nothing she can do. (1.4/0)

* 26. Moshe finds out that some members of his social sports team have been saying that he is not a very good player. *What action would be the most effective for Moshe?*
(a) Although he may be bad at sport remember he is good at other things. (4.2/.417)
(b) Forget about it. (3.4/0)
(c) Do some extra training to try and improve. (4.4/.583)
(d) Leave that sports team. (1.6/0)

27. Joel has always dealt with one particular client but on a very complex job his boss gives the task to a co-worker instead. Joel wonders whether his boss thinks he can't handle the important jobs. *What action would be the most effective for Joel?*
(a) Believe he is performing well and will be given the next complex job. (3.4/0)
(b) Do good work so that he will be given the complex tasks in future. (4.0/.167)
(c) Ask his boss why the co-worker was given the job. (4.2/.750)
(d) Not worry about this unless it happens again. (3.2/.083)

28. Hasina is overseas when she finds out that her father has passed away from an illness he has had for years. *What action would be the most effective for Hasina?*
(a) Contact her close relatives for information and support. (5.6/1.00)

(b) Try not to think about it, going on with her daily life as best she can. (2.00/0)
(c) Feel terrible that she left the country at such a time. (1.4/0)
(d) Think deeply about the more profound meaning of this loss. (4.0/0)

29. Mina and her sister-in-law normally get along quite well, and the sister-in-law regularly baby-sits for her for a small fee. Lately she has also been cleaning away cobwebs, commenting on the mess, which Mina finds insulting. *What action would be the most effective for Mina?*
(a) Tell her sister-in-law these comments upset her. (4.6/.750)
(b) Get a new babysitter. (2.0/0)
(c) Be grateful her house is being cleaned for free. (2.6/.167)
(d) Tell her only to baby-sit, not to clean. (3.0/.083)

* 30. Billy is nervous about acting a scene when there are a lot of very experienced actors in the crowd. *What action would be the most effective for Billy?*
(a) Put things in perspective – it is not the end of the world. (3.4/.250)
(b) Use some acting techniques to clam his nerves. (4.6/.417)
(c) Believe in himself and know it will be fine. (3.6/0)
(d) Practice his scenes more so that he will act well. (5.0/.333)

31. Juno is fairly sure his company is going down and his job is under threat. It is a large company and nothing official has been said. *What action would be the most effective for Juno?*
(a) Find out what is happening and discuss his concerns with his family. (5.0/.750)
(b) Try to keep the company afloat by working harder. (2.0/0)
(c) Start applying for other jobs. (3.8/.250)
(d) Think of these events as an opportunity for a new start. (4.8/0)

32. Mallory moves from a small company to a very large one, where there is little personal contact, which she misses. *What action would be the most effective for Mallory?*
(a) Talk to her workmates, try to create social contacts and make friends. (5.2/.917)
(b) Start looking for a new job so she can leave that environment. (2.2/0)
(c) Just give it time, and things will be okay. (2.8/0)
(d) Concentrate on her outside-work friends and colleagues from previous jobs. (3.0/.083)

33. A demanding client takes up a lot of Jill's time and then asks to speak to Jill's boss about her performance. Although Jill's boss assures her that her performance is fine, Jill feels upset. *What action would be the most effective for Jill?*
(a) Talk to her friends or workmates about it. (3.4/0)
(b) Ignore the incident and move on to her next task. (2.2/0)
(c) Calm down by taking deep breaths or going for a short walk. (3.8/.083)
(d) Think that she has been successful in the past and this client being difficult is not her fault. (4.4/.917)

34. Blair and Flynn usually go to a cafe after the working week and chat about what's going on in the company. After Blair's job is moved to a different section in the company, he stops coming to the cafe. Flynn misses these Friday talks. *What action would be the most effective for Flynn?*

(a) Go to the cafe or socialize with other workers. (3.8/.167)
(b) Don't worry about it, ignore the changes and let Blair be. (2.0/0)
(c) Not talk to Blair again. (1.2/0)
(d) Invite Blair again, maybe rescheduling for another time. (5.2/.833)

* 35. Jerry has had several short-term jobs in the same industry, but is excited about starting a job in a different industry. His father casually remarks that he will probably last six months. *What action would be the most effective for Jerry?*
(a) Tell his father he is completely wrong. (2.4/0)
(b) Prove him wrong by working hard to succeed at the new job. (4.0/.417)
(c) Think of the positives of the new job. (4.6/.083)
(d) Ignore his father's comments. (3.6/.500)

36. Michelle's friend Dara is moving overseas to live with her partner. They have been good friends for many years and Dara is unlikely to come back. *What action would be the most effective for Michelle?*
(a) Forget about Dara. (1.6/0)
(b) Spend time with other friends, keeping herself busy. (3.6/.083)
(c) Think that Dara and her partner will return soon. (1.6/0)
(d) Make sure she keeps in contact through email, phone or letter writing. (5.2/.917)

37. Dorian needs to have some prostate surgery and is quite scared about the process. He has heard that it is quite painful. *What action would be the most effective for Dorian?*
(a) Find out as much as he can about the procedure and focus on calming down. (5.4/.333)
(b) Keep busy in the meantime so he doesn't think about the impending surgery. (3.4/0)
(c) Talk to his family about his concerns. (4.4/0)
(d) Talk to his doctor about what will happen. (5.2/.667)

38. Hannah's access to essential resources has been delayed and her work is way behind schedule. Her progress report makes no mention of the lack of resources. *What action would be the most effective for Hannah?*
(a) Explain the lack of resources to her boss or to management. (5.0/.167)
(b) Learn that she should plan ahead for next time. (3.4/0)
(c) Document the lack of resources in her progress report. (5.2/.833)
(d) Don't worry about it. (1.4/0)

* 39. Jill is given an official warning for entering a restricted area. She was never informed that the area was restricted and will lose her job if she gets two more warnings, which she thinks is unfair. *What action would be the most effective for Jill?*
(a) Think about the unfairness of the situation. (1.6/0)
(b) Accept the warning and be careful not to go in restricted areas from now on. (3.8/.500)
(c) Explain that she didn't know it was restricted. (4.8/.500)
(d) Take a few deep breaths and calm down about it. (3.8/0)

40. Alana has been acting in a high-ranking role for several months. A decision is made that only long-term employees can now act in these roles, and Alana has not been with the company long

enough to do so. *What action would be the most effective for Alana?*
(a) Quit that position. (2.4/.083)
(b) Use that experience to get promoted when she is long term. (4.2/.583)
(c) Accept this new rule, but feel hard-done-by. (1.8/0)
(d) Ask management if an exception can be made. (4.8/.333)

* 41. Reece’s friend points out that her young children seem to be developing more quickly than Reece's. Reece sees that this is true. *What action would be the most effective for Reece?*
(a) Talk the issue over with another friend. (3.6/0)
(b) Angrily confront her friend about making such statements. (1.8/0)
(c) Realize that children develop at different rates. (4.4/.250)
(d) Talk to a doctor about what the normal rates of development are. (5.0/.750)

* 42. Jumah has been working at a new job part-time while he studies. His shift times for the week are changed at the last minute, without consulting him. *What action would be the most effective for Jumah?*
(a) Refuse to work the new shifts. (1.8/0)
(b) Find out if there is some reasonable explanation for the shift changes. (4.4/.750)
(c) Tell the manager in charge of shifts that he is not happy about it. (3.8/.250)
(d) Grumpily accept the changes and do the shifts. (2.2/0)

43. Jacob is having a large family gathering to celebrate him moving into his new home. He wants the day to go smoothly and is a little nervous about it. *What action would be the most effective for Jacob?*
(a) Talk to friends or relatives to ease his worries. (3.6/.083)
(b) Try to calm down, perhaps go for a short walk or meditate. (3.8/.083)
(c) Prepare ahead of time so he has everything he needs available. (5.2/.417)
(d) Accept that things aren’t going to be perfect but the family will understand. (4.4/.417)

44. Julie hasn’t seen Ka for ages and looks forward to their weekend trip away. However, Ka has changed a lot and Julie finds that she is no longer an interesting companion. *What action would be the most effective for Julie?*
(a) Cancel the trip and go home. (2.0/0)
(b) Realize that it is time to give up the friendship and move on. (3.2/0)
(c) Understand that people change, so move on, but remember the good times. (4.6/.917)
(d) Concentrate on her other, more rewarding friendships. (4.4/.08)

APPENDIX D. FIVE-FACTOR MODEL IPIP-NEO PERSONALITY INDEX

How Accurately Can You Describe Yourself?

Describe yourself as you generally are now, not as you wish to be in the future.

Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age.

So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence.

Indicate for each statement whether it is: 1. Very Inaccurate, 2. Moderately Inaccurate, 3. Neither Accurate Nor Inaccurate, 4. Moderately Accurate, or 5. Very Accurate as a description of you.

	Very Inaccurate	Moderately Inaccurate	Neither Accurate Nor Inaccurate	Moderately Accurate	Very Accurate	
1. Am the life of the party.	O	O	O	O	O	(1+)
2. Insult people.	O	O	O	O	O	(2-)
3. Am always prepared.	O	O	O	O	O	(3+)
4. Get stressed out easily.	O	O	O	O	O	(4-)
5. Have a rich vocabulary.	O	O	O	O	O	(5+)
6. Often feel uncomfortable around others.	O	O	O	O	O	(1-)
7. Am interested in people.	O	O	O	O	O	(2+)
8. Leave my belongings around.	O	O	O	O	O	(3-)
9. Am relaxed most of the time.	O	O	O	O	O	(4+)

10. Have difficulty understanding abstract ideas.	***O***	***O***	***O***	***O***	***O***	*(5-)*
11. Feel comfortable around people.	***O***	***O***	***O***	***O***	***O***	*(1+)*
12. Am not interested in other people's problems.	***O***	***O***	***O***	***O***	***O***	*(2-)*
13. Pay attention to details.	***O***	***O***	***O***	***O***	***O***	*(3+)*
14. Worry about things.	***O***	***O***	***O***	***O***	***O***	*(4-)*
15. Have a vivid imagination.	***O***	***O***	***O***	***O***	***O***	*(5+)*
16. Keep in the background.	***O***	***O***	***O***	***O***	***O***	*(1-)*
17. Sympathize with others' feelings.	***O***	***O***	***O***	***O***	***O***	*(2+)*
18. Make a mess of things.	***O***	***O***	***O***	***O***	***O***	*(3-)*
19. Seldom feel blue.	***O***	***O***	***O***	***O***	***O***	*(4+)*
20. Am not interested in abstract ideas.	***O***	***O***	***O***	***O***	***O***	*(5-)*
21. Start conversations.	***O***	***O***	***O***	***O***	***O***	*(1+)*
22. Feel little concern for others.	***O***	***O***	***O***	***O***	***O***	*(2-)*
23. Get chores done right away.	***O***	***O***	***O***	***O***	***O***	*(3+)*
24. Am easily disturbed.	***O***	***O***	***O***	***O***	***O***	*(4-)*
25. Have excellent ideas.	***O***	***O***	***O***	***O***	***O***	*(5+)*
26. Have little to say.	***O***	***O***	***O***	***O***	***O***	*(1-)*
27. Have a soft heart.	***O***	***O***	***O***	***O***	***O***	*(2+)*

28. Often forget to put things back in their proper place.	***O***	***O***	***O***	***O***	***O***	*(3-)*
29. Am not easily bothered by things.	***O***	***O***	***O***	***O***	***O***	*(4+)*
30. Do not have a good imagination.	***O***	***O***	***O***	***O***	***O***	*(5-)*
31. Talk to a lot of different people at parties.	***O***	***O***	***O***	***O***	***O***	*(1+)*
32. Am not really interested in others.	***O***	***O***	***O***	***O***	***O***	*(2-)*
33. Like order.	***O***	***O***	***O***	***O***	***O***	*(3+)*
34. Get upset easily.	***O***	***O***	***O***	***O***	***O***	*(4-)*
35. Am quick to understand things.	***O***	***O***	***O***	***O***	***O***	*(5+)*
36. Don't like to draw attention to myself.	***O***	***O***	***O***	***O***	***O***	*(1-)*
37. Take time out for others.	***O***	***O***	***O***	***O***	***O***	*(2+)*
38. Shirk my duties.	***O***	***O***	***O***	***O***	***O***	*(3-)*
39. Rarely get irritated.	***O***	***O***	***O***	***O***	***O***	*(4+)*
40. Try to avoid complex people.	***O***	***O***	***O***	***O***	***O***	*(5-)*
41. Don't mind being the center of attention.	***O***	***O***	***O***	***O***	***O***	*(1+)*
42. Am hard to get to know.	***O***	***O***	***O***	***O***	***O***	*(2-)*
43. Follow a schedule.	***O***	***O***	***O***	***O***	***O***	*(3+)*
44. Change my mood a lot.	***O***	***O***	***O***	***O***	***O***	*(4-)*
45. Use difficult words.	***O***	***O***	***O***	***O***	***O***	*(5+)*

46. Am quiet around strangers.	*O*	*O*	*O*	*O*	*O*	(1-)
47. Feel others' emotions.	*O*	*O*	*O*	*O*	*O*	(2+)
48. Neglect my duties.	*O*	*O*	*O*	*O*	*O*	(3-)
49. Seldom get mad.	*O*	*O*	*O*	*O*	*O*	(4+)
50. Have difficulty imagining things.	*O*	*O*	*O*	*O*	*O*	(5-)
51. Make friends easily.	*O*	*O*	*O*	*O*	*O*	(1+)
52. Am indifferent to the feelings of others.	*O*	*O*	*O*	*O*	*O*	(2-)
53. Am exacting in my work.	*O*	*O*	*O*	*O*	*O*	(3+)
54. Have frequent mood swings.	*O*	*O*	*O*	*O*	*O*	(4-)
55. Spend time reflecting on things.	*O*	*O*	*O*	*O*	*O*	(5+)
56. Find it difficult to approach others.	*O*	*O*	*O*	*O*	*O*	(1-)
57. Make people feel at ease.	*O*	*O*	*O*	*O*	*O*	(2+)
58. Waste my time.	*O*	*O*	*O*	*O*	*O*	(3-)
59. Get irritated easily.	*O*	*O*	*O*	*O*	*O*	(4-)
60. Avoid difficult reading material.	*O*	*O*	*O*	*O*	*O*	(5-)
61. Take charge.	*O*	*O*	*O*	*O*	*O*	(1+)
62. Inquire about others' well-being.	*O*	*O*	*O*	*O*	*O*	(2+)
63. Do things according to a plan.	*O*	*O*	*O*	*O*	*O*	(3+)
64. Often feel blue.	*O*	*O*	*O*	*O*	*O*	(4-)

65. Am full of ideas.	*O*	*O*	*O*	*O*	*O*	(5+)
66. Don't talk a lot.	*O*	*O*	*O*	*O*	*O*	(1-)
67. Know how to comfort others.	*O*	*O*	*O*	*O*	*O*	(2+)
68. Do things in a half-way manner.	*O*	*O*	*O*	*O*	*O*	(3-)
69. Get angry easily.	*O*	*O*	*O*	*O*	*O*	(4-)
70. Will not probe deeply into a subject.	*O*	*O*	*O*	*O*	*O*	(5-)
71. Know how to captivate people.	*O*	*O*	*O*	*O*	*O*	(1+)
72. Love children.	*O*	*O*	*O*	*O*	*O*	(2+)
73. Continue until everything is perfect.	*O*	*O*	*O*	*O*	*O*	(3+)
74. Panic easily.	*O*	*O*	*O*	*O*	*O*	(4-)
75. Carry the conversation to a higher level.	*O*	*O*	*O*	*O*	*O*	(5+)
76. Bottle up my feelings.	*O*	*O*	*O*	*O*	*O*	(1-)
77. Am on good terms with nearly everyone.	*O*	*O*	*O*	*O*	*O*	(2+)
78. Find it difficult to get down to work.	*O*	*O*	*O*	*O*	*O*	(3-)
79. Feel threatened easily.	*O*	*O*	*O*	*O*	*O*	(4-)
80. Catch on to things quickly.	*O*	*O*	*O*	*O*	*O*	(5+)
81. Feel at ease with people.	*O*	*O*	*O*	*O*	*O*	(1+)
82. Have a good word for everyone.	*O*	*O*	*O*	*O*	*O*	(2+)

83. Make plans and stick to them.	***O***	***O***	***O***	***O***	***O***	*(3+)*
84. Get overwhelmed by emotions.	***O***	***O***	***O***	***O***	***O***	*(4-)*
85. Can handle a lot of information.	***O***	***O***	***O***	***O***	***O***	*(5+)*
86. Am a very private person.	***O***	***O***	***O***	***O***	***O***	*(1-)*
87. Show my gratitude.	***O***	***O***	***O***	***O***	***O***	*(2+)*
88. Leave a mess in my room.	***O***	***O***	***O***	***O***	***O***	*(3-)*
89. Take offense easily.	***O***	***O***	***O***	***O***	***O***	*(4-)*
90. Am good at many things.	***O***	***O***	***O***	***O***	***O***	*(5+)*
91. Wait for others to lead the way.	***O***	***O***	***O***	***O***	***O***	*(1-)*
92. Think of others first.	***O***	***O***	***O***	***O***	***O***	*(2+)*
93. Love order and regularity.	***O***	***O***	***O***	***O***	***O***	*(3+)*
94. Get caught up in my problems.	***O***	***O***	***O***	***O***	***O***	*(4-)*
95. Love to read challenging material.	***O***	***O***	***O***	***O***	***O***	*(5+)*
96. Am skilled in handling social situations.	***O***	***O***	***O***	***O***	***O***	*(1+)*
97. Love to help others.	***O***	***O***	***O***	***O***	***O***	*(2+)*
98. Like to tidy up.	***O***	***O***	***O***	***O***	***O***	*(3+)*
99. Grumble about things.	***O***	***O***	***O***	***O***	***O***	*(4-)*
100. Love to think up new ways of doing things.	***O***	***O***	***O***	***O***	***O***	*(5+)*

APPENDIX E. NASA TASK LOAD INDEX (TLX)

Figure 8.6

NASA Task Load Index

Hart and Staveland's NASA Task Load Index (TLX) method assesses work load on five 7-point scales. Increments of high, medium and low estimates for each point result in 21 gradations on the scales.

Name	Task	Date

Mental Demand — How mentally demanding was the task?

Very Low — Very High

Physical Demand — How physically demanding was the task?

Very Low — Very High

Temporal Demand — How hurried or rushed was the pace of the task?

Very Low — Very High

Performance — How successful were you in accomplishing what you were asked to do?

Perfect — Failure

Effort — How hard did you have to work to accomplish your level of performance?

Very Low — Very High

Frustration — How insecure, discouraged, irritated, stressed, and annoyed wereyou?

Very Low — Very High

APPENDIX F. PANAS-X GENERAL MOOD STATE INDICATOR

This scale consists of a number of words and phrases that describe different feelings and emotions.

Read each item and then mark the appropriate answer in the space next to that word.

Indicate to what extent you have felt this way **<u>during the last session.</u>**

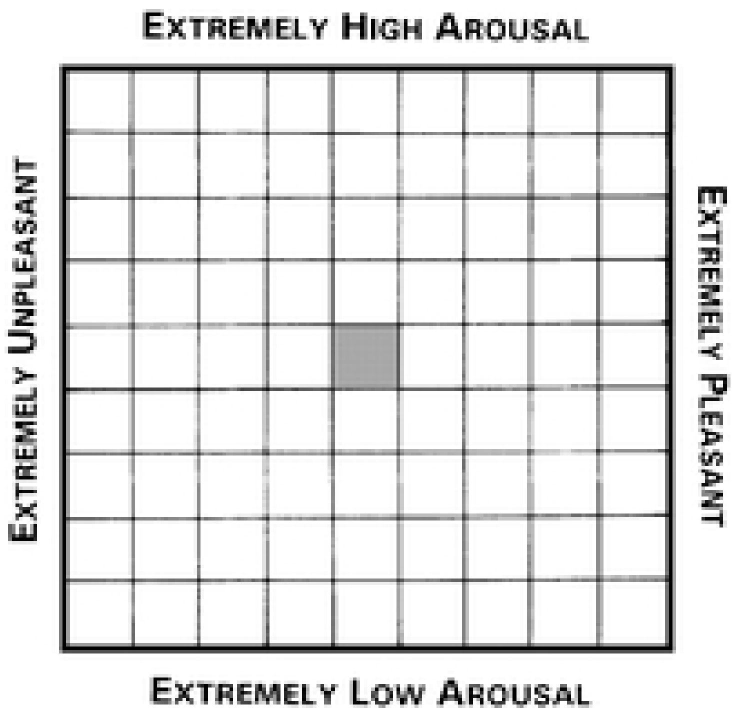
Use the following scale to record your answers:

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely

Afraid	Attentive
Scared	Determined
Nervous	Enthusiastic
Jittery	Excited
Irritable	Inspired
Hostile	Interested
Guilty	Proud
Ashamed	Strong
Upset	Active
Distressed	Alert

Derived from Watson & Clark (1994)

APPENDIX G. SELF-REPORT AFFECT GRID & SLIDER SCALES



“Affect Grid” Russell, Weiss & Mendelsohn, 1989

Indicate your perceived level of **Arousal or Excitement**

Extremely Low								**Extremely High**
1	2	3	4	5	6	7	8	9

Indicate your perceived level of **Pleasantness**

Extremely Unpleasant								**Extremely Pleasant**
1	2	3	4	5	6	7	8	9

APPENDIX H. COGNITIVE TEST EXAMPLES

Chapter 7
Choice Reaction Time (CRT)

CRT description

CRT is a 2-choice reaction time test which is similar to the Simple Reaction Time test except that stimulus and response uncertainty are introduced by having two possible stimuli and two possible responses.

Display

An arrow-shaped stimulus is displayed on either the left or the right side of the screen.

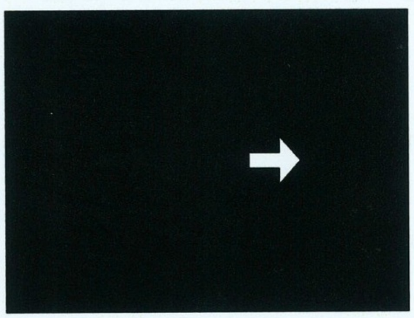


Figure 7-1 The CRT task screen

Task

The subject must press the left hand button on the press pad if the stimulus is displayed on the left hand side of the screen, and the right hand button on the press pad if the stimulus is displayed on the right hand side of the screen.

There is a practice stage (block 1) of 24 trials and two assessment stages (block 2 and block 3), each of 50 trials.

CRT

Chapter 18
Stockings of Cambridge (SOC)

SOC description

SOC is a test of spatial planning and spatial working memory, which gives a measure of frontal lobe function.

Display

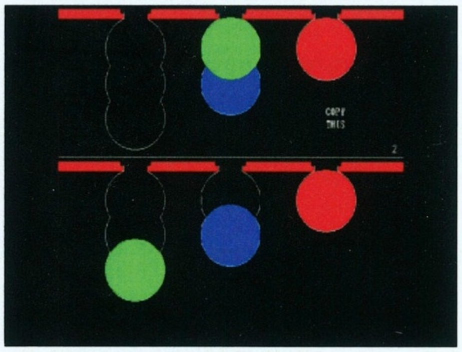


Figure 18-1 The SOC task screen

The subject is shown two displays containing three coloured balls. The displays are presented in such a way that they can easily be perceived as stacks of coloured balls held in stockings or socks suspended from a beam. This arrangement makes the 3-D concepts involved apparent to the subject, and fits with the verbal instructions.

Task

The subject must use the balls in the lower display to copy the pattern shown in the upper display. The balls may be moved one at a time by touching the required ball, SOC

then touching the position to which it should be moved. The time taken to complete the pattern and the number of moves required are taken as measures of the subject's planning ability.

At first it is only necessary to move one ball, the number being increased in steps to four moves. At this point, a procedure controlling for motor performance is inserted. The upper display moves one ball at a time, repeating the moves made by the subject in the corresponding previous planning phase. The subject must follow the upper display by moving the balls in the lower display. Again, the number of moves increases from 2 to 4. The difference in time taken to complete (but more especially, to initiate) each problem is taken as an index of the additional time taken to plan the solution of the copying, as distinct from the yoked following task.

A second block of planning problems of 2, 4, and 5 moves follows, and the test is completed with a second block of motor control problems. Should the subject make more than double the number of moves necessary for the simplest solution, the problem is terminated. Should the computer terminate three problems in a row, the entire test ends. There is no time limit.

The first problem is for demonstration by the tester. After that, subjects must make all the moves themselves.

SOC test modes

The SOC test has one mode:

- clinical

SOC administration script

Problem 1 (example)

With the SOC start screen displayed, press [SPACE] to begin the test, and say:	I am going to show you how this works. You can see that there are two arrangements…

Chapter 10
Intra/Extradimensional Set Shift (IED)

IED description

Intra/Extradimensional Set Shift is a test of rule acquisition and reversal. It features:

- ❒ visual discrimination and attentional set formation
- ❒ maintenance, shifting and flexibility of attention

This test is primarily sensitive to changes to the fronto-striatal areas of the brain.

! **Big/Little Circle (BLC) should always be administered before this test.**

Display

Two artificial dimensions are used in the test:

- ❒ colour-filled shapes
- ❒ white lines

Simple stimuli are made up of just one of these dimensions, whereas compound stimuli are made up of both, namely white lines overlying colour-filled shapes.

Subjects progress through the test by satisfying a set criterion of learning at each stage (6 consecutive correct responses). If at any stage the subject fails to reach this criterion after 50 trials, the test terminates.

IED

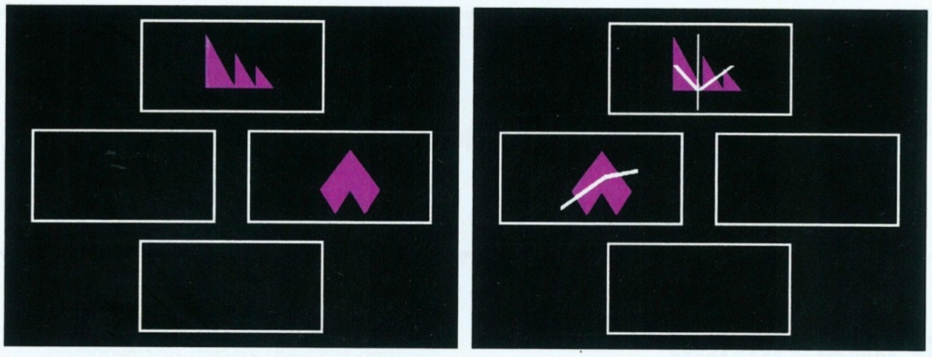


Figure 10-1 The IED test screen for block 1 (left) and block 4(right)

Task

The test starts with Block 1, the presentation of two simple, colour-filled shapes. The subject must learn which of the stimuli is correct by touching it, and continue until the criterion is reached. In Block 2, the contingencies are reversed, so that now the previously incorrect stimulus is correct.

In Block 3, the second dimension is then introduced, initially lying adjacent to, and then, for Block 4, overlapping, the first dimension. The contingencies do not change, remaining the same as at the end of the simple discrimination. Once the criterion has been reached with the overlapping compound stimulus in Block 4, the contingencies are reversed for Block 5, within the original dimension. It is important to note that the second dimension is entirely redundant to the solution of the problem at this stage.

Once the subject has learned the compound discrimination, new compound stimuli are presented (Block 6), still varying along the same 2 dimensions (of shape and of line). Subjects are required to continue to attend to the previously relevant dimension of shape and learn which of the two new exemplars is correct (the 'intradimensional shift').

Once the subject has completed a successful intradimensional shift, followed by a reversal (Block 7), again the compound stimuli are changed. For this stage (Block 8), subjects are required to shift attention to the previously irrelevant dimension and learn which of the two exemplars in this dimension is now correct (the 'extradimensional shift'). In Block 9 the contingencies are again reversed.

APPENDIX I. DEBRIEFING QUESTIONNAIRE

1) Did you notice any attacks, manipulations, or changes in the system while you were operating it?

If so, did you learn to cope with it, and how?

2) Was there any point when you thought you might not be able to finish the game? If so, what made you change your mind?

3) Do you think your performance of the task was affected in any way or at any time by the video clips?

4) Was anything particularly frustrating about the task itself?

APPENDIX J. PERSONALITY & SCORE CORRELATION MATRIX

		Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Intellect/Imagination
Average Score	Pearson Correlation	.030	-.169	-.100	-.264	.010
	Sig. (2-tailed)	.868	.347	.580	.138	.956
	N	33	33	33	33	33
No Attack Average	Pearson Correlation	.025	-.147	-.077	-.229	.075
	Sig. (2-tailed)	.892	.414	.672	.200	.680
	N	33	33	33	33	33
Tracking Attack Average	Pearson Correlation	-.004	-.331	-.188	-.287	-.214
	Sig. (2-tailed)	.985	.059	.294	.106	.233
	N	33	33	33	33	33
Fuel Mgt Attack Average	Pearson Correlation	-.029	-.250	.004	-.194	.049
	Sig. (2-tailed)	.871	.161	.983	.279	.787
	N	33	33	33	33	33
Score Display Attack Average	Pearson Correlation	-.026	-.079	-.044	-.178	.074
	Sig. (2-tailed)	.888	.660	.807	.322	.684
	N	33	33	33	33	33
Positive Valence Average	Pearson Correlation	.100	-.168	-.069	-.089	-.029
	Sig. (2-tailed)	.581	.349	.703	.622	.873
	N	33	33	33	33	33
Negative Valence Average	Pearson Correlation	.058	-.173	-.131	-.070	.005
	Sig. (2-tailed)	.750	.336	.466	.700	.976
	N	33	33	33	33	33
Session 1 - No Attack	Pearson Correlation	.111	-.079	-.065	-.244	.107
	Sig. (2-tailed)	.537	.662	.719	.172	.555
	N	33	33	33	33	33
Session 1 - Tracking Attack	Pearson Correlation	-.066	-.190	-.181	-.423*	-.146
	Sig. (2-tailed)	.715	.290	.314	.014	.418
	N	33	33	33	33	33
Session 1 - Fuel Mgt Attack	Pearson Correlation	.097	-.141	.073	-.146	.060
	Sig. (2-tailed)	.590	.433	.686	.419	.739
	N	33	33	33	33	33
Session 1 - Score Display	Pearson Correlation	-.012	-.103	-.065	-.253	-.010
	Sig. (2-	.948	.568	.720	.156	.958

Attack	tailed)					
	N	33	33	33	33	33
Session 2 - No Attack	Pearson Correlation	.009	-.118	-.128	-.244	.044
	Sig. (2-tailed)	.960	.512	.477	.171	.810
	N	33	33	33	33	33
Session 2 - Tracking Attack	Pearson Correlation	.067	-.356*	-.186	-.143	-.253
	Sig. (2-tailed)	.709	.042	.299	.426	.156
	N	33	33	33	33	33
Session 2 - Fuel Mgt Attack	Pearson Correlation	-.080	-.219	-.182	-.317	.030
	Sig. (2-tailed)	.659	.221	.310	.072	.869
	N	33	33	33	33	33
Session 2 - Score Display Attack	Pearson Correlation	.022	.018	-.058	-.125	.163
	Sig. (2-tailed)	.904	.923	.749	.487	.366
	N	33	33	33	33	33
Session 1 - Positive Valence	Pearson Correlation	.086	-.101	.031	-.288	-.036
	Sig. (2-tailed)	.634	.577	.862	.104	.843
	N	33	33	33	33	33
Session 1 - Negative Valence	Pearson Correlation	.012	-.171	-.117	-.241	.079
	Sig. (2-tailed)	.946	.340	.516	.177	.663
	N	33	33	33	33	33
Session 2 - Positive Valence	Pearson Correlation	.020	-.145	-.120	-.233	.027
	Sig. (2-tailed)	.911	.421	.507	.191	.880
	N	33	33	33	33	33
Session 2 - Negative Valence	Pearson Correlation	-.013	-.229	-.188	-.225	-.037
	Sig. (2-tailed)	.942	.201	.295	.208	.838
	N	33	33	33	33	33

APPENDIX K. EMOTIONAL REGULATION ABILITY & SCORE CORRELATION MATRIX

		ERA - MER weighted	ERA - PEC weighted
Average Score	Pearson Correlation	-.243	-.202
	Sig. (2-tailed)	.174	.260
	N	33	33
No Attack Average	Pearson Correlation	-.219	-.190
	Sig. (2-tailed)	.220	.290
	N	33	33
Tracking Attack Average	Pearson Correlation	-.100	-.064
	Sig. (2-tailed)	.579	.724
	N	33	33
Fuel Mgt Attack Average	Pearson Correlation	-.314	-.257
	Sig. (2-tailed)	.076	.149
	N	33	33
Score Display Attack Average	Pearson Correlation	-.187	-.196
	Sig. (2-tailed)	.298	.275
	N	33	33
Positive Valence Average	Pearson Correlation	-.196	-.188
	Sig. (2-tailed)	.274	.295
	N	33	33
Negative Valence Average	Pearson Correlation	-.052	-.056
	Sig. (2-tailed)	.774	.758
	N	33	33
Session 1 - No Attack	Pearson Correlation	-.199	-.155
	Sig. (2-tailed)	.267	.390
	N	33	33
Session 1 - Tracking Attack	Pearson Correlation	-.021	-.003
	Sig. (2-tailed)	.906	.987
	N	33	33
Session 1 - Fuel Mgt Attack	Pearson Correlation	-.293	-.222
	Sig. (2-tailed)	.098	.215
	N	33	33
Session 1 - Score Display Attack	Pearson Correlation	-.179	-.199
	Sig. (2-tailed)	.318	.266
	N	33	33
Session 2 - No Attack	Pearson Correlation	-.206	-.180
	Sig. (2-tailed)	.249	.316

	N	33	33
Session 2 - Tracking Attack	Pearson Correlation	-.235	-.180
	Sig. (2-tailed)	.187	.317
	N	33	33
Session 2 - Fuel Mgt Attack	Pearson Correlation	-.274	-.223
	Sig. (2-tailed)	.122	.211
	N	33	33
Session 2 - Score Display Attack	Pearson Correlation	-.181	-.165
	Sig. (2-tailed)	.313	.358
	N	33	33
Session 1 - Positive Valence	Pearson Correlation	-.273	-.250
	Sig. (2-tailed)	.125	.160
	N	33	33
Session 1 - Negative Valence	Pearson Correlation	-.149	-.098
	Sig. (2-tailed)	.409	.586
	N	33	33
Session 2 - Positive Valence	Pearson Correlation	-.288	-.239
	Sig. (2-tailed)	.104	.180
	N	33	33
Session 2 - Negative Valence	Pearson Correlation	-.200	-.168
	Sig. (2-tailed)	.265	.350
	N	33	33

APPENDIX L. COGNITIVE TESTING IED & SCORE CORRELATION MATRIX

		IED - Stages completed	IED - total errors	IED - total errors adjusted
Average Score	Pearson Correlation	.341*	-.202	-.295
	Sig. (2-tailed)	.049	.252	.091
	N	34	34	34
No Attack Average	Pearson Correlation	.339	-.223	-.302
	Sig. (2-tailed)	.050	.205	.083
	N	34	34	34
Tracking Attack Average	Pearson Correlation	.189	.003	-.111
	Sig. (2-tailed)	.284	.988	.533
	N	34	34	34
Fuel Mgt Attack Average	Pearson Correlation	.297	-.241	-.286
	Sig. (2-tailed)	.088	.170	.101
	N	34	34	34
Score Display Attack Average	Pearson Correlation	.343*	-.173	-.282
	Sig. (2-tailed)	.047	.327	.106
	N	34	34	34
Positive Valence Average	Pearson Correlation	.038	.089	.033
	Sig. (2-tailed)	.830	.615	.853
	N	34	34	34
Negative Valence Average	Pearson Correlation	.031	.026	-.002
	Sig. (2-tailed)	.861	.884	.992
	N	34	34	34
Session 1 - No Attack	Pearson Correlation	.290	-.238	-.280
	Sig. (2-tailed)	.096	.175	.109
	N	34	34	34
Session 1 - Tracking Attack	Pearson Correlation	.022	.105	.045
	Sig. (2-tailed)	.901	.555	.801
	N	34	34	34
Session 1 - Fuel Mgt Attack	Pearson Correlation	.341*	-.280	-.337
	Sig. (2-tailed)	.049	.109	.051
	N	34	34	34
Session 1 - Score Display Attack	Pearson Correlation	.344*	-.248	-.322
	Sig. (2-tailed)	.046	.158	.063
	N	34	34	34
Session 2 - No Attack	Pearson Correlation	.381*	-.224	-.333
	Sig. (2-tailed)	.026	.202	.054
	N	34	34	34
Session 2 - Tracking Attack	Pearson Correlation	.307	-.062	-.208

	Sig. (2-tailed)	.078	.727	.239
	N	34	34	34
Session 2 - Fuel Mgt Attack	Pearson Correlation	.219	-.195	-.217
	Sig. (2-tailed)	.212	.269	.219
	N	34	34	34
Session 2 - Score Display Attack	Pearson Correlation	.333	-.106	-.243
	Sig. (2-tailed)	.054	.550	.166
	N	34	34	34
Session 1 - Positive Valence	Pearson Correlation	.318	-.231	-.296
	Sig. (2-tailed)	.067	.189	.090
	N	34	34	34
Session 1 - Negative Valence	Pearson Correlation	.272	-.187	-.249
	Sig. (2-tailed)	.119	.288	.156
	N	34	34	34
Session 2 - Positive Valence	Pearson Correlation	.334	-.104	-.236
	Sig. (2-tailed)	.054	.558	.179
	N	34	34	34
Session 2 - Negative Valence	Pearson Correlation	.353*	-.231	-.324
	Sig. (2-tailed)	.040	.188	.062
	N	34	34	34

APPENDIX M. COGNITIVE TESTING SOC & SCORE CORRELATION MATRIX

		SOC - mean initial thinking time	SOC - mean subsequent thinking time	SOC - problems solved in min moves
Average Score	Pearson Correlation	.266	-.151	.180
	Sig. (2-tailed)	.129	.393	.309
	N	34	34	34
No Attack Average	Pearson Correlation	.248	-.141	.199
	Sig. (2-tailed)	.157	.426	.260
	N	34	34	34
Tracking Attack Average	Pearson Correlation	.254	-.068	.192
	Sig. (2-tailed)	.148	.701	.277
	N	34	34	34
Fuel Mgt Attack Average	Pearson Correlation	.191	-.082	.054
	Sig. (2-tailed)	.280	.646	.762
	N	34	34	34
Score Display Attack Average	Pearson Correlation	.299	-.180	.209
	Sig. (2-tailed)	.086	.309	.234
	N	34	34	34
Positive Valence Average	Pearson Correlation	.347*	.079	.116
	Sig. (2-tailed)	.044	.658	.512
	N	34	34	34
Negative Valence Average	Pearson Correlation	.316	.016	.224
	Sig. (2-tailed)	.068	.928	.204
	N	34	34	34
Session 1 - No Attack	Pearson Correlation	.194	-.152	.126
	Sig. (2-tailed)	.272	.391	.477
	N	34	34	34
Session 1 - Tracking Attack	Pearson Correlation	.276	-.179	.248
	Sig. (2-tailed)	.114	.311	.158
	N	34	34	34
Session 1 - Fuel Mgt Attack	Pearson Correlation	.167	-.076	-.045
	Sig. (2-tailed)	.346	.669	.799
	N	34	34	34
Session 1 - Score Display Attack	Pearson Correlation	.245	-.208	.237
	Sig. (2-tailed)	.163	.238	.176
	N	34	34	34
Session 2 - No Attack	Pearson Correlation	.258	-.154	.262
	Sig. (2-tailed)	.141	.386	.135
	N	34	34	34

Session 2 - Tracking Attack	Pearson Correlation	.228	.019	.128
	Sig. (2-tailed)	.195	.914	.470
	N	34	34	34
Session 2 - Fuel Mgt Attack	Pearson Correlation	.161	-.136	.197
	Sig. (2-tailed)	.363	.442	.263
	N	34	34	34
Session 2 - Score Display Attack	Pearson Correlation	.320	-.163	.169
	Sig. (2-tailed)	.065	.358	.340
	N	34	34	34
Session 1 - Positive Valence	Pearson Correlation	.185	-.093	-.028
	Sig. (2-tailed)	.296	.600	.875
	N	34	34	34
Session 1 - Negative Valence	Pearson Correlation	.280	-.227	.295
	Sig. (2-tailed)	.109	.196	.090
	N	34	34	34
Session 2 - Positive Valence	Pearson Correlation	.318	-.177	.254
	Sig. (2-tailed)	.067	.315	.148
	N	34	34	34
Session 2 - Negative Valence	Pearson Correlation	.213	-.064	.166
	Sig. (2-tailed)	.227	.719	.348
	N	34	34	34

APPENDIX N. COGNITIVE TESTING CRT & SCORE CORRELATION MATRIX

		CRT - mean correct latency	CRT - max correct latency	CRT - percent correct trials
Average Score	Pearson Correlation	-.368*	-.234	-.225
	Sig. (2-tailed)	.032	.183	.200
	N	34	34	34
No Attack Average	Pearson Correlation	-.322	-.147	-.134
	Sig. (2-tailed)	.063	.406	.449
	N	34	34	34
Tracking Attack Average	Pearson Correlation	-.288	-.377*	-.316
	Sig. (2-tailed)	.099	.028	.069
	N	34	34	34
Fuel Mgt Attack Average	Pearson Correlation	-.286	-.130	-.252
	Sig. (2-tailed)	.101	.462	.151
	N	34	34	34
Score Display Attack Average	Pearson Correlation	-.449**	-.248	-.192
	Sig. (2-tailed)	.008	.158	.277
	N	34	34	34
Positive Valence Average	Pearson Correlation	-.290	-.279	-.192
	Sig. (2-tailed)	.097	.109	.277
	N	34	34	34
Negative Valence Average	Pearson Correlation	-.281	-.287	-.156
	Sig. (2-tailed)	.108	.100	.377
	N	34	34	34
Session 1 - No Attack	Pearson Correlation	-.293	-.061	-.104
	Sig. (2-tailed)	.093	.732	.557
	N	34	34	34
Session 1 - Tracking Attack	Pearson Correlation	-.296	-.292	-.237
	Sig. (2-tailed)	.090	.094	.177
	N	34	34	34
Session 1 - Fuel Mgt Attack	Pearson Correlation	-.174	.031	-.207
	Sig. (2-tailed)	.324	.860	.241
	N	34	34	34
Session 1 - Score Display Attack	Pearson Correlation	-.340*	-.218	-.188
	Sig. (2-tailed)	.049	.216	.286
	N	34	34	34
Session 2 - No Attack	Pearson Correlation	-.314	-.227	-.135
	Sig. (2-tailed)	.070	.197	.445

	N	34	34	34
Session 2 - Tracking Attack	Pearson Correlation	-.238	-.366*	-.280
	Sig. (2-tailed)	.175	.033	.109
	N	34	34	34
Session 2 - Fuel Mgt Attack	Pearson Correlation	-.377*	-.332	-.230
	Sig. (2-tailed)	.028	.055	.191
	N	34	34	34
Session 2 - Score Display Attack	Pearson Correlation	-.522**	-.259	-.164
	Sig. (2-tailed)	.002	.139	.355
	N	34	34	34
Session 1 - Positive Valence	Pearson Correlation	-.305	-.092	-.239
	Sig. (2-tailed)	.080	.605	.173
	N	34	34	34
Session 1 - Negative Valence	Pearson Correlation	-.273	-.149	-.156
	Sig. (2-tailed)	.118	.399	.379
	N	34	34	34
Session 2 - Positive Valence	Pearson Correlation	-.417*	-.384*	-.226
	Sig. (2-tailed)	.014	.025	.199
	N	34	34	34
Session 2 - Negative Valence	Pearson Correlation	-.391*	-.269	-.221
	Sig. (2-tailed)	.022	.125	.208
	N	34	34	34

APPENDIX O. RESULTS OF STASTICAL ANALYSES

Stat results

Statistix 10.0 2/25/2014, 11:37:34 AM

Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P
subject_n (A)	29	1.188E+10	4.095E+08		
Attack_Ty (B)	3	6.191E+10	2.064E+10	72.68	0.0000
Error A*B	87	2.470E+10	2.839E+08		
Valence_S (C)	1	2.461E+08	2.461E+08	1.21	0.2806
Error A*C	29	5.905E+09	2.036E+08		
Session (D)	1	4.912E+09	4.912E+09	18.82	0.0002
Error A*D	29	7.570E+09	2.610E+08		
B*C	3	9.047E+07	3.016E+07	0.15	0.9280
Error A*B*C	87	1.723E+10	1.981E+08		
B*D	3	4.267E+08	1.422E+08	0.51	0.6743
Error A*B*D	87	2.412E+10	2.772E+08		
C*D	1	9.832E+08	9.832E+08	4.05	0.0537
Error A*C*D	29	7.048E+09	2.430E+08		
B*C*D	3	1.158E+09	3.861E+08	2.93	0.0381
Error A*B*C*D	87	1.147E+10	1.318E+08		
Total	479	1.796E+11			

Grand Mean	-7869.0
CV(subject_n*Attack_Ty)	-214.14
CV(subject_n*Valence_S)	-181.33
CV(subject_n*Session)	-205.33
CV(subject_n*Attack_Ty*Valence_S)	-178.85
CV(subject_n*Attack_Ty*Session)	-211.59
CV(subject_n*Valence_S*Session)	-198.11
CV(subject_n*Attack_Ty*Valence_S*Session)	-145.92

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	72.68	0.0000	0.0000	0.0000
Attack_Ty*Valence_S	0.15	0.6992	0.9047	0.9203
Attack_Ty*Session	0.51	0.4795	0.6066	0.6200
Attack_Ty*Valence_S*Session	2.93	0.0977	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7046	0.7614	0.35974	28.34	5	0.0000
subject_n*Attack_Ty*Valence_S	0.3333	0.8574	0.9480	0.77402	7.10	5	0.2132
subject_n*Attack_Ty*Session	0.3333	0.6867	0.7400	0.52817	17.70	5	0.0034
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

//

Statistix 10.0 2/25/2014, 4:23:52 PM

Repeated Measures AOV Table for PTT_1

Source	DF	SS	MS	F	P
subject_n (A)	29	756620	26090.3		
Attack_Ty (B)	3	19653	6550.8	2.29	0.0837
Error A*B	87	248627	2857.8		
Valence_S (C)	1	1290	1290.4	0.43	0.5187
Error A*C	29	87665	3022.9		
Session (D)	1	142	141.9	0.03	0.8722

Error A*D	29	156249	5387.9		
B*C	3	18628	6209.5	2.24	0.0898
Error A*B*C	87	241688	2778.0		
B*D	3	6770	2256.8	1.06	0.3700
Error A*B*D	87	185087	2127.4		
C*D	1	4922	4921.6	1.54	0.2239
Error A*C*D	29	92403	3186.3		
B*C*D	3	7120	2373.2	0.67	0.5711
Error A*B*C*D	87	306973	3528.4		
Total	479	2133837			

Grand Mean	432.36
CV(subject_n*Attack_Ty)	12.36
CV(subject_n*Valence_S)	12.72
CV(subject_n*Session)	16.98
CV(subject_n*Attack_Ty*Valence_S)	12.19
CV(subject_n*Attack_Ty*Session)	10.67
CV(subject_n*Valence_S*Session)	13.06
CV(subject_n*Attack_Ty*Valence_S*Session)	13.74

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	2.29	0.1408	0.0931	0.0861
Attack_Ty*Valence_S	2.24	0.1457	0.1093	0.1039
Attack_Ty*Session	1.06	0.3115	0.3673	0.3700
Attack_Ty*Valence_S*Session	0.67	0.4188	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8717	0.9659	0.77938	6.91	5	0.2274
subject_n*Attack_Ty*Valence_S	0.3333	0.7463	0.8118	0.61395	13.52	5	0.0189
subject_n*Attack_Ty*Session	0.3333	0.9307	1.0000	0.89144	3.19	5	0.6714
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for PTT_2

Source	DF	SS	MS	F	P
subject_n (A)	29	788311	27183.1		
Attack_Ty (B)	3	3485	1161.7	0.41	0.7458
Error A*B	87	246193	2829.8		
Valence_S (C)	1	1138	1137.8	0.32	0.5738
Error A*C	29	101952	3515.6		
Session (D)	1	11	11.1	0.00	0.9650
Error A*D	29	163916	5652.3		
B*C	3	18218	6072.6	1.88	0.1392
Error A*B*C	87	281273	3233.0		
B*D	3	5634	1878.1	0.76	0.5208
Error A*B*D	87	215601	2478.2		
C*D	1	13388	13388.0	3.84	0.0596
Error A*C*D	29	101044	3484.3		
B*C*D	3	21216	7072.1	2.86	0.0414
Error A*B*C*D	87	215037	2471.7		
Total	479	2176418			

Grand Mean	432.81
CV(subject_n*Attack_Ty)	12.29
CV(subject_n*Valence_S)	13.70
CV(subject_n*Session)	17.37
CV(subject_n*Attack_Ty*Valence_S)	13.14
CV(subject_n*Attack_Ty*Session)	11.50
CV(subject_n*Valence_S*Session)	13.64
CV(subject_n*Attack_Ty*Valence_S*Session)	11.49

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.41	0.5267	0.6916	0.7088
Attack_Ty*Valence_S	1.88	0.1810	0.1513	0.1457
Attack_Ty*Session	0.76	0.3911	0.5054	0.5175
Attack_Ty*Valence_S*Session	2.86	0.1015	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P

subject_n*Attack_Ty	0.3333	0.7603	0.8288	0.55109	16.52	5	0.0055
subject_n*Attack_Ty*Valence_S	0.3333	0.8202	0.9021	0.68071	10.66	5	0.0585
subject_n*Attack_Ty*Session	0.3333	0.8772	0.9727	0.76720	7.35	5	0.1961
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for PTT_3

Source	DF	SS	MS	F	P
subject_n (A)	29	908675	31333.6		
Attack_Ty (B)	3	27107	9035.8	1.18	0.3236
Error A*B	87	668404	7682.8		
Valence_S (C)	1	3991	3990.5	0.47	0.4975
Error A*C	29	245176	8454.4		
Session (D)	1	18130	18130.2	2.30	0.1401
Error A*D	29	228527	7880.2		
B*C	3	14056	4685.4	0.45	0.7175
Error A*B*C	87	904660	10398.4		
B*D	3	14429	4809.8	0.64	0.5943
Error A*B*D	87	658780	7572.2		
C*D	1	5122	5122.1	1.19	0.2843
Error A*C*D	29	124814	4303.9		
B*C*D	3	22364	7454.6	0.94	0.4244
Error A*B*C*D	87	689053	7920.1		
Total	479	4533289			

Grand Mean	422.55
CV(subject_n*Attack_Ty)	20.74
CV(subject_n*Valence_S)	21.76
CV(subject_n*Session)	21.01
CV(subject_n*Attack_Ty*Valence_S)	24.13
CV(subject_n*Attack_Ty*Session)	20.59
CV(subject_n*Valence_S*Session)	15.53
CV(subject_n*Attack_Ty*Valence_S*Session)	21.06

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	1.18	0.2871	0.3041	0.3056
Attack_Ty*Valence_S	0.45	0.5074	0.5886	0.5970
Attack_Ty*Session	0.64	0.4319	0.4978	0.5046
Attack_Ty*Valence_S*Session	0.94	0.3400	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.4760	0.4937	0.15858	51.05	5	0.0000
subject_n*Attack_Ty*Valence_S	0.3333	0.5118	0.5347	0.20465	43.98	5	0.0000
subject_n*Attack_Ty*Session	0.3333	0.5235	0.5483	0.14297	53.92	5	0.0000
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for PTT_4

Source	DF	SS	MS	F	P
subject_n (A)	29	752820	25959.3		
Attack_Ty (B)	3	883	294.4	0.14	0.9380
Error A*B	87	187762	2158.2		
Valence_S (C)	1	23	22.5	0.01	0.9418
Error A*C	29	120625	4159.5		
Session (D)	1	85	85.0	0.02	0.9004
Error A*D	29	154586	5330.6		
B*C	3	246	82.0	0.04	0.9892
Error A*B*C	87	178032	2046.3		
B*D	3	10288	3429.3	1.71	0.1701
Error A*B*D	87	174089	2001.0		
C*D	1	90	90.1	0.02	0.8789
Error A*C*D	29	110623	3814.6		
B*C*D	3	11287	3762.4	1.89	0.1377
Error A*B*C*D	87	173475	1994.0		
Total	479	1874915			

Grand Mean	416.25
CV(subject_n*Attack_Ty)	11.16
CV(subject_n*Valence_S)	15.49
CV(subject_n*Session)	17.54
CV(subject_n*Attack_Ty*Valence_S)	10.87
CV(subject_n*Attack_Ty*Session)	10.75
CV(subject_n*Valence_S*Session)	14.84
CV(subject_n*Attack_Ty*Valence_S*Session)	10.73

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.14	0.7146	0.8948	0.9090
Attack_Ty*Valence_S	0.04	0.8427	0.9760	0.9821
Attack_Ty*Session	1.71	0.2008	0.1791	0.1740
Attack_Ty*Valence_S*Session	1.89	0.1801	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7522	0.8189	0.61299	13.57	5	0.0186
subject_n*Attack_Ty*Valence_S	0.3333	0.7918	0.8672	0.61844	13.32	5	0.0205
subject_n*Attack_Ty*Session	0.3333	0.8450	0.9327	0.75051	7.96	5	0.1586
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for HR_1

Source	DF	SS	MS	F	P
subject_n (A)	29	63493.5	2189.43		
Attack_Ty (B)	3	38.0	12.66	0.33	0.8016
Error A*B	87	3310.1	38.05		
Valence_S (C)	1	141.7	141.71	3.36	0.0772
Error A*C	29	1224.4	42.22		
Session (D)	1	16.2	16.17	0.29	0.5969
Error A*D	29	1640.4	56.56		
B*C	3	19.1	6.38	0.16	0.9254
Error A*B*C	87	3551.3	40.82		
B*D	3	27.4	9.12	0.20	0.8985
Error A*B*D	87	4036.8	46.40		
C*D	1	33.5	33.49	0.56	0.4610
Error A*C*D	29	1739.9	60.00		
B*C*D	3	276.5	92.18	2.40	0.0737
Error A*B*C*D	87	3347.3	38.47		
Total	479	82896.1			

Grand Mean	71.357
CV(subject_n*Attack_Ty)	8.64
CV(subject_n*Valence_S)	9.11
CV(subject_n*Session)	10.54
CV(subject_n*Attack_Ty*Valence_S)	8.95
CV(subject_n*Attack_Ty*Session)	9.55
CV(subject_n*Valence_S*Session)	10.85
CV(subject_n*Attack_Ty*Valence_S*Session)	8.69

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.33	0.5685	0.7926	0.8016
Attack_Ty*Valence_S	0.16	0.6955	0.8889	0.9044
Attack_Ty*Session	0.20	0.6608	0.8711	0.8888
Attack_Ty*Valence_S*Session	2.40	0.1325	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.9552	1.0000	0.93030	2.00	5	0.8488
subject_n*Attack_Ty*Valence_S	0.3333	0.7956	0.8718	0.61819	13.33	5	0.0204
subject_n*Attack_Ty*Session	0.3333	0.8541	0.9440	0.77034	7.23	5	0.2039
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for HR_2

Source	DF	SS	MS	F	P
subject_n (A)	29	65134.1	2246.00		
Attack_Ty (B)	3	458.5	152.84	4.46	0.0058
Error A*B	87	2981.2	34.27		
Valence_S (C)	1	62.9	62.89	1.68	0.2051

Error A*C	29	1085.4	37.43		
Session (D)	1	67.2	67.19	0.83	0.3699
Error A*D	29	2349.0	81.00		
B*C	3	92.9	30.96	0.86	0.4669
Error A*B*C	87	3144.4	36.14		
B*D	3	35.1	11.70	0.37	0.7752
Error A*B*D	87	2754.8	31.66		
C*D	1	3.7	3.67	0.06	0.8118
Error A*C*D	29	1843.3	63.56		
B*C*D	3	244.5	81.48	2.67	0.0523
Error A*B*C*D	87	2651.8	30.48		
Total	479	82908.8			

Grand Mean	70.364
CV(subject_n*Attack_Ty)	8.32
CV(subject_n*Valence_S)	8.69
CV(subject_n*Session)	12.79
CV(subject_n*Attack_Ty*Valence_S)	8.54
CV(subject_n*Attack_Ty*Session)	8.00
CV(subject_n*Valence_S*Session)	11.33
CV(subject_n*Attack_Ty*Valence_S*Session)	7.85

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	4.46	0.0434	0.0112	0.0090
Attack_Ty*Valence_S	0.86	0.3624	0.4420	0.4499
Attack_Ty*Session	0.37	0.5480	0.7433	0.7634
Attack_Ty*Valence_S*Session	2.67	0.1129	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7802	0.8530	0.64042	12.35	5	0.0302
subject_n*Attack_Ty*Valence_S	0.3333	0.7597	0.8279	0.58238	14.99	5	0.0104
subject_n*Attack_Ty*Session	0.3333	0.8526	0.9421	0.73612	8.49	5	0.1311
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for HR_3

Source	DF	SS	MS	F	P
subject_n (A)	29	72282.5	2492.50		
Attack_Ty (B)	3	82.5	27.51	0.76	0.5179
Error A*B	87	3136.9	36.06		
Valence_S (C)	1	70.4	70.35	5.29	0.0288
Error A*C	29	385.4	13.29		
Session (D)	1	166.3	166.26	1.80	0.1906
Error A*D	29	2684.9	92.58		
B*C	3	180.3	60.10	1.55	0.2083
Error A*B*C	87	3381.2	38.86		
B*D	3	19.6	6.52	0.27	0.8498
Error A*B*D	87	2133.5	24.52		
C*D	1	3.3	3.31	0.08	0.7807
Error A*C*D	29	1214.7	41.88		
B*C*D	3	80.7	26.90	0.90	0.4448
Error A*B*C*D	87	2601.1	29.90		
Total	479	88423.2			

Grand Mean	77.224
CV(subject_n*Attack_Ty)	7.78
CV(subject_n*Valence_S)	4.72
CV(subject_n*Session)	12.46
CV(subject_n*Attack_Ty*Valence_S)	8.07
CV(subject_n*Attack_Ty*Session)	6.41
CV(subject_n*Valence_S*Session)	8.38
CV(subject_n*Attack_Ty*Valence_S*Session)	7.08

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.76	0.3896	0.4804	0.4897
Attack_Ty*Valence_S	1.55	0.2236	0.2190	0.2164
Attack_Ty*Session	0.27	0.6100	0.7938	0.8114
Attack_Ty*Valence_S*Session	0.90	0.3507	M	M

Sphericity Assumption Tests

	Greenhouse	Huynh

Source	Minimum Epsilon	Geisser Epsilon	Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7231	0.7836	0.58913	14.67	5	0.0119
subject_n*Attack_Ty*Valence_S	0.3333	0.7437	0.8085	0.56069	16.04	5	0.0067
subject_n*Attack_Ty*Session	0.3333	0.7545	0.8217	0.59765	14.27	5	0.0140
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for HR_4

Source	DF	SS	MS	F	P
subject_n (A)	29	80799.6	2786.19		
Attack_Ty (B)	3	44.9	14.96	0.43	0.7295
Error A*B	87	3001.1	34.50		
Valence_S (C)	1	58.7	58.74	5.19	0.0302
Error A*C	29	327.9	11.31		
Session (D)	1	257.7	257.67	2.85	0.1023
Error A*D	29	2625.2	90.52		
B*C	3	75.2	25.06	0.72	0.5406
Error A*B*C	87	3012.3	34.62		
B*D	3	41.8	13.93	0.51	0.6793
Error A*B*D	87	2396.5	27.55		
C*D	1	3.7	3.67	0.11	0.7441
Error A*C*D	29	981.0	33.83		
B*C*D	3	47.8	15.92	0.49	0.6934
Error A*B*C*D	87	2854.3	32.81		
Total	479	96527.6			

Grand Mean	78.570
CV(subject_n*Attack_Ty)	7.48
CV(subject_n*Valence_S)	4.28
CV(subject_n*Session)	12.11
CV(subject_n*Attack_Ty*Valence_S)	7.49
CV(subject_n*Attack_Ty*Session)	6.68
CV(subject_n*Valence_S*Session)	7.40
CV(subject_n*Attack_Ty*Valence_S*Session)	7.29

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.43	0.5154	0.6512	0.6654
Attack_Ty*Valence_S	0.72	0.4019	0.5215	0.5343
Attack_Ty*Session	0.51	0.4827	0.6340	0.6502
Attack_Ty*Valence_S*Session	0.49	0.4916	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.6698	0.7198	0.41161	24.61	5	0.0002
subject_n*Attack_Ty*Valence_S	0.3333	0.8606	0.9520	0.74984	7.98	5	0.1573
subject_n*Attack_Ty*Session	0.3333	0.7795	0.8521	0.62759	12.91	5	0.0242
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for EDA_1

Source	DF	SS	MS	F	P
subject_n (A)	29	13353.0	460.448		
Attack_Ty (B)	3	4.5	1.511	0.75	0.5258
Error A*B	87	175.5	2.018		
Valence_S (C)	1	0.5	0.521	0.26	0.6128
Error A*C	29	57.7	1.989		
Session (D)	1	1.7	1.695	0.05	0.8295
Error A*D	29	1040.8	35.891		
B*C	3	8.3	2.767	1.18	0.3224
Error A*B*C	87	204.2	2.347		

B*D	3	2.9	0.973	0.68	0.5643
Error A*B*D	87	123.8	1.423		
C*D	1	2.8	2.807	0.63	0.4332
Error A*C*D	29	128.9	4.444		
B*C*D	3	13.2	4.389	2.22	0.0918
Error A*B*C*D	87	172.2	1.979		
Total	479	15290.1			

Grand Mean	6.8671
CV(subject_n*Attack_Ty)	20.68
CV(subject_n*Valence_S)	20.54
CV(subject_n*Session)	87.24
CV(subject_n*Attack_Ty*Valence_S)	22.31
CV(subject_n*Attack_Ty*Session)	17.37
CV(subject_n*Valence_S*Session)	30.70
CV(subject_n*Attack_Ty*Valence_S*Session)	20.49

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.75	0.3939	0.4857	0.4952
Attack_Ty*Valence_S	1.18	0.2865	0.3178	0.3195
Attack_Ty*Session	0.68	0.4150	0.5050	0.5144
Attack_Ty*Valence_S*Session	2.22	0.1472	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7154	0.7744	0.54440	16.86	5	0.0048
subject_n*Attack_Ty*Valence_S	0.3333	0.7527	0.8194	0.56279	15.94	5	0.0070
subject_n*Attack_Ty*Session	0.3333	0.6490	0.6951	0.45151	22.04	5	0.0005
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for EDA_2

Source	DF	SS	MS	F	P
subject_n (A)	29	13470.6	464.504		
Attack_Ty (B)	3	52.8880	17.629	6.84	0.0003
Error A*B	87	224.186	2.577		
Valence_S (C)	1	18.7634	18.763	7.03	0.0128
Error A*C	29	77.3697	2.668		
Session (D)	1	0.01694	0.017	0.00	0.9805
Error A*D	29	808.821	27.890		
B*C	3	54.1483	18.049	9.16	0.0000
Error A*B*C	87	171.490	1.971		
B*D	3	6.39117	2.130	1.66	0.1812
Error A*B*D	87	111.531	1.282		
C*D	1	2.73023	2.730	0.77	0.3868
Error A*C*D	29	102.555	3.536		
B*C*D	3	11.2812	3.760	2.23	0.0906
Error A*B*C*D	87	146.842	1.688		
Total	479	15259.6			

Grand Mean	6.6983
CV(subject_n*Attack_Ty)	23.96
CV(subject_n*Valence_S)	24.38
CV(subject_n*Session)	78.84
CV(subject_n*Attack_Ty*Valence_S)	20.96
CV(subject_n*Attack_Ty*Session)	16.90
CV(subject_n*Valence_S*Session)	28.07
CV(subject_n*Attack_Ty*Valence_S*Session)	19.40

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	6.84	0.0140	0.0011	0.0007
Attack_Ty*Valence_S	9.16	0.0052	0.0002	0.0001
Attack_Ty*Session	1.66	0.2075	0.1979	0.1952
Attack_Ty*Valence_S*Session	2.23	0.1463	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7848	0.8586	0.65172	11.87	5	0.0366
subject_n*Attack_Ty*Valence_S	0.3333	0.7200	0.7799	0.56708	15.73	5	0.0077
subject_n*Attack_Ty*Session	0.3333	0.6840	0.7367	0.48269	20.19	5	0.0011

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for EDA_3

Source	DF	SS	MS	F	P
subject_n (A)	29	16789.0	578.930		
Attack_Ty (B)	3	6.7	2.241	1.39	0.2508
Error A*B	87	140.1	1.611		
Valence_S (C)	1	0.4	0.377	0.17	0.6851
Error A*C	29	65.2	2.247		
Session (D)	1	73.0	73.035	1.77	0.1939
Error A*D	29	1197.7	41.300		
B*C	3	1.5	0.513	0.22	0.8820
Error A*B*C	87	202.6	2.329		
B*D	3	4.6	1.526	0.90	0.4453
Error A*B*D	87	147.7	1.698		
C*D	1	0.6	0.555	0.22	0.6449
Error A*C*D	29	74.2	2.558		
B*C*D	3	2.2	0.737	0.37	0.7755
Error A*B*C*D	87	173.8	1.998		
Total	479	18879.3			

Grand Mean	8.2769
CV(subject_n*Attack_Ty)	15.33
CV(subject_n*Valence_S)	18.11
CV(subject_n*Session)	77.64
CV(subject_n*Attack_Ty*Valence_S)	18.44
CV(subject_n*Attack_Ty*Session)	15.74
CV(subject_n*Valence_S*Session)	19.32
CV(subject_n*Attack_Ty*Valence_S*Session)	17.08

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	1.39	0.2477	0.2521	0.2508
Attack_Ty*Valence_S	0.22	0.6423	0.8688	0.8820
Attack_Ty*Session	0.90	0.3510	0.4146	0.4207
Attack_Ty*Valence_S*Session	0.37	0.5482	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.9455	1.0000	0.90566	2.75	5	0.7389
subject_n*Attack_Ty*Valence_S	0.3333	0.9284	1.0000	0.87467	3.71	5	0.5915
subject_n*Attack_Ty*Session	0.3333	0.6818	0.7341	0.42101	23.98	5	0.0002
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for EDA_4

Source	DF	SS	MS	F	P
subject_n (A)	29	15905.0	548.449		
Attack_Ty (B)	3	1.4	0.466	0.42	0.7413
Error A*B	87	97.3	1.119		
Valence_S (C)	1	2.2	2.220	1.16	0.2896
Error A*C	29	55.3	1.908		
Session (D)	1	54.8	54.822	1.33	0.2586
Error A*D	29	1197.4	41.289		
B*C	3	0.8	0.256	0.14	0.9353
Error A*B*C	87	158.0	1.816		
B*D	3	2.1	0.691	0.52	0.6674
Error A*B*D	87	114.9	1.321		
C*D	1	1.2	1.201	0.51	0.4811
Error A*C*D	29	68.4	2.358		
B*C*D	3	4.6	1.550	0.74	0.5314
Error A*B*C*D	87	182.4	2.096		
Total	479	17845.9			

Grand Mean	7.8074
CV(subject_n*Attack_Ty)	13.55
CV(subject_n*Valence_S)	17.69
CV(subject_n*Session)	82.30
CV(subject_n*Attack_Ty*Valence_S)	17.26
CV(subject_n*Attack_Ty*Session)	14.72
CV(subject_n*Valence_S*Session)	19.67
CV(subject_n*Attack_Ty*Valence_S*Session)	18.55

Greenhouse-Geisser Corrected P-Values for Nonsphericity

	Minimum	Greenhouse Geisser	Huynh Feldt

Source	F	Epsilon P	Epsilon P	Epsilon P
Attack_Ty	0.42	0.5236	0.7088	0.7283
Attack_Ty*Valence_S	0.14	0.7103	0.9150	0.9300
Attack_Ty*Session	0.52	0.4752	0.6266	0.6429
Attack_Ty*Valence_S*Session	0.74	0.3969	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8474	0.9357	0.68487	10.49	5	0.0624
subject_n*Attack_Ty*Valence_S	0.3333	0.8680	0.9612	0.74121	8.30	5	0.1404
subject_n*Attack_Ty*Session	0.3333	0.7955	0.8717	0.70262	9.78	5	0.0816
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_HR_C

Source	DF	SS	MS	F	P
subject_n (A)	29	2951.9	101.789		
Attack_Ty (B)	3	629.8	209.921	3.37	0.0222
Error A*B	87	5422.5	62.327		
Valence_S (C)	1	393.4	393.397	4.19	0.0498
Error A*C	29	2722.8	93.891		
Session (D)	1	17.4	17.433	0.33	0.5710
Error A*D	29	1539.4	53.083		
B*C	3	75.2	25.076	0.34	0.7977
Error A*B*C	87	6449.8	74.135		
B*D	3	50.7	16.915	0.21	0.8887
Error A*B*D	87	6982.5	80.259		
C*D	1	15.0	14.991	0.15	0.7030
Error A*C*D	29	2932.3	101.113		
B*C*D	3	338.9	112.956	2.04	0.1141
Error A*B*C*D	87	4816.9	55.367		
Total	479	35338.6			

Grand Mean	-0.9929
CV(subject_n*Attack_Ty)	-795.15
CV(subject_n*Valence_S)	-975.93
CV(subject_n*Session)	-733.81
CV(subject_n*Attack_Ty*Valence_S)	-867.20
CV(subject_n*Attack_Ty*Session)	-902.31
CV(subject_n*Valence_S*Session)	-1012.77
CV(subject_n*Attack_Ty*Valence_S*Session)	-749.43

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	3.37	0.0767	0.0273	0.0227
Attack_Ty*Valence_S	0.34	0.5653	0.7673	0.7877
Attack_Ty*Session	0.21	0.6496	0.8696	0.8884
Attack_Ty*Valence_S*Session	2.04	0.1639	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8885	0.9868	0.79106	6.50	5	0.2608
subject_n*Attack_Ty*Valence_S	0.3333	0.8593	0.9505	0.73421	8.57	5	0.1277
subject_n*Attack_Ty*Session	0.3333	0.8976	0.9982	0.85239	4.43	5	0.4896
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for DEL_PTT_C

Source	DF	SS	MS	F	P

subject_n (A)	29	128692	4437.7		
Attack_Ty (B)	3	18786	6262.0	1.45	0.2325
Error A*B	87	374476	4304.3		
Valence_S (C)	1	4851	4851.4	1.04	0.3173
Error A*C	29	135876	4685.4		
Session (D)	1	232	232.4	0.08	0.7853
Error A*D	29	89111	3072.8		
B*C	3	10078	3359.4	0.73	0.5366
Error A*B*C	87	400110	4599.0		
B*D	3	18904	6301.4	1.40	0.2493
Error A*B*D	87	392580	4512.4		
C*D	1	34544	34544.1	6.68	0.0151
Error A*C*D	29	150000	5172.4		
B*C*D	3	17642	5880.8	1.62	0.1915
Error A*B*C*D	87	316603	3639.1		
Total	479	2092487			

Grand Mean	0.4500
CV(subject_n*Attack_Ty)	14579.41
CV(subject_n*Valence_S)	15211.06
CV(subject_n*Session)	12318.41
CV(subject_n*Attack_Ty*Valence_S)	15070.15
CV(subject_n*Attack_Ty*Session)	14927.66
CV(subject_n*Valence_S*Session)	15982.11
CV(subject_n*Attack_Ty*Valence_S*Session)	13405.57

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	1.45	0.2375	0.2348	0.2325
Attack_Ty*Valence_S	0.73	0.3997	0.5226	0.5358
Attack_Ty*Session	1.40	0.2469	0.2551	0.2542
Attack_Ty*Valence_S*Session	1.62	0.2138	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.9305	1.0000	0.87593	3.67	5	0.5975
subject_n*Attack_Ty*Valence_S	0.3333	0.8944	0.9943	0.82157	5.45	5	0.3636
subject_n*Attack_Ty*Session	0.3333	0.7195	0.7794	0.54075	17.04	5	0.0044
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for DEL_EDA_C

Source	DF	SS	MS	F	P
subject_n (A)	29	118.820	4.0972		
Attack_Ty (B)	3	72.6100	24.2033	7.62	0.0001
Error A*B	87	276.501	3.1782		
Valence_S (C)	1	13.0336	13.0336	5.12	0.0313
Error A*C	29	73.7696	2.5438		
Session (D)	1	2.05032	2.0503	0.72	0.4020
Error A*D	29	82.2104	2.8348		
B*C	3	53.3857	17.7952	8.65	0.0000
Error A*B*C	87	178.893	2.0562		
B*D	3	1.97642	0.6588	0.44	0.7261
Error A*B*D	87	130.733	1.5027		
C*D	1	5.254E-04	0.0005	0.00	0.9892
Error A*C*D	29	82.4043	2.8415		
B*C*D	3	9.61118	3.2037	1.27	0.2898
Error A*B*C*D	87	219.483	2.5228		
Total	479	1315.48			

Grand Mean	-0.1688
CV(subject_n*Attack_Ty)	-1056.23
CV(subject_n*Valence_S)	-944.95
CV(subject_n*Session)	-997.55
CV(subject_n*Attack_Ty*Valence_S)	-849.59
CV(subject_n*Attack_Ty*Session)	-726.28
CV(subject_n*Valence_S*Session)	-998.73
CV(subject_n*Attack_Ty*Valence_S*Session)	-941.05

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	7.62	0.0099	0.0004	0.0003
Attack_Ty*Valence_S	8.65	0.0064	0.0001	0.0001
Attack_Ty*Session	0.44	0.5131	0.7127	0.7261

Attack_Ty*Valence_S*Session	1.27	0.2690	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8240	0.9067	0.72984	8.73	5	0.1203
subject_n*Attack_Ty*Valence_S	0.3333	0.8383	0.9244	0.70717	9.61	5	0.0872
subject_n*Attack_Ty*Session	0.3333	0.9333	1.0000	0.90006	2.92	5	0.7125
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_EDA_R

Source	DF	SS	MS	F	P
subject_n (A)	29	676.47	23.3264		
Attack_Ty (B)	3	8.25	2.7501	0.72	0.5438
Error A*B	87	333.21	3.8300		
Valence_S (C)	1	4.89	4.8901	1.58	0.2185
Error A*C	29	89.64	3.0910		
Session (D)	1	75.79	75.7932	14.67	0.0006
Error A*D	29	149.83	5.1667		
B*C	3	4.35	1.4484	0.59	0.6212
Error A*B*C	87	212.47	2.4422		
B*D	3	5.56	1.8545	0.66	0.5784
Error A*B*D	87	244.18	2.8067		
C*D	1	7.68	7.6797	2.32	0.1385
Error A*C*D	29	95.97	3.3093		
B*C*D	3	23.34	7.7800	2.94	0.0376
Error A*B*C*D	87	230.23	2.6464		
Total	479	2161.86			

Grand Mean	0.9403
CV(subject_n*Attack_Ty)	208.14
CV(subject_n*Valence_S)	186.98
CV(subject_n*Session)	241.75
CV(subject_n*Attack_Ty*Valence_S)	166.21
CV(subject_n*Attack_Ty*Session)	178.18
CV(subject_n*Valence_S*Session)	193.47
CV(subject_n*Attack_Ty*Valence_S*Session)	173.01

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.72	0.4037	0.5229	0.5357
Attack_Ty*Valence_S	0.59	0.4475	0.5882	0.6035
Attack_Ty*Session	0.66	0.4229	0.5363	0.5482
Attack_Ty*Valence_S*Session	2.94	0.0971	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8496	0.9384	0.75494	7.79	5	0.1680
subject_n*Attack_Ty*Valence_S	0.3333	0.8156	0.8963	0.72907	8.76	5	0.1190
subject_n*Attack_Ty*Session	0.3333	0.7457	0.8110	0.45589	21.78	5	0.0006
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_PTT_R

Source	DF	SS	MS	F	P
subject_n (A)	29	193622	6676.62		
Attack_Ty (B)	3	19016	6338.70	1.63	0.1891
Error A*B	87	339050	3897.12		
Valence_S (C)	1	972	971.85	0.17	0.6816
Error A*C	29	164068	5657.51		
Session (D)	1	447	446.60	0.08	0.7759
Error A*D	29	156831	5407.96		
B*C	3	20489	6829.79	2.01	0.1186
Error A*B*C	87	295749	3399.42		
B*D	3	27072	9023.92	3.13	0.0299
Error A*B*D	87	251139	2886.66		
C*D	1	3680	3679.67	0.71	0.4071
Error A*C*D	29	150787	5199.57		
B*C*D	3	12708	4236.13	0.96	0.4161
Error A*B*C*D	87	384514	4419.70		
Total	479	2020144			

Grand Mean	-16.106
CV(subject_n*Attack_Ty)	-387.59
CV(subject_n*Valence_S)	-467.00
CV(subject_n*Session)	-456.59
CV(subject_n*Attack_Ty*Valence_S)	-362.00
CV(subject_n*Attack_Ty*Session)	-333.58
CV(subject_n*Valence_S*Session)	-447.70
CV(subject_n*Attack_Ty*Valence_S*Session)	-412.76

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	1.63	0.2123	0.1935	0.1891
Attack_Ty*Valence_S	2.01	0.1670	0.1290	0.1224
Attack_Ty*Session	3.13	0.0876	0.0362	0.0310
Attack_Ty*Valence_S*Session	0.96	0.3357	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.9135	1.0000	0.86255	4.10	5	0.5352
subject_n*Attack_Ty*Valence_S	0.3333	0.8545	0.9445	0.77795	6.96	5	0.2236
subject_n*Attack_Ty*Session	0.3333	0.8814	0.9780	0.79796	6.26	5	0.2820
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_HR_R

Source	DF	SS	MS	F	P
subject_n (A)	29	18134.0	625.310		
Attack_Ty (B)	3	35.4	11.810	0.18	0.9083
Error A*B	87	5641.6	64.846		
Valence_S (C)	1	382.9	382.912	6.82	0.0141
Error A*C	29	1627.2	56.110		
Session (D)	1	403.0	402.952	5.73	0.0234
Error A*D	29	2039.5	70.327		
B*C	3	122.3	40.782	0.73	0.5353
Error A*B*C	87	4843.1	55.668		
B*D	3	49.5	16.500	0.25	0.8646
Error A*B*D	87	5857.4	67.326		
C*D	1	59.4	59.354	0.46	0.5033
Error A*C*D	29	3747.1	129.210		
B*C*D	3	348.3	116.097	2.16	0.0991
Error A*B*C*D	87	4686.4	53.866		
Total	479	47977.0			

Grand Mean	7.2126
CV(subject_n*Attack_Ty)	111.65
CV(subject_n*Valence_S)	103.85

CV(subject_n*Session)	116.27
CV(subject_n*Attack_Ty*Valence_S)	103.45
CV(subject_n*Attack_Ty*Session)	113.76
CV(subject_n*Valence_S*Session)	157.60
CV(subject_n*Attack_Ty*Valence_S*Session)	101.76

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.18	0.6727	0.8898	0.9072
Attack_Ty*Valence_S	0.73	0.3991	0.5236	0.5353
Attack_Ty*Session	0.25	0.6243	0.8468	0.8646
Attack_Ty*Valence_S*Session	2.16	0.1528	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8937	0.9934	0.84838	4.56	5	0.4721
subject_n*Attack_Ty*Valence_S	0.3333	0.9097	1.0000	0.86931	3.88	5	0.5664
subject_n*Attack_Ty*Session	0.3333	0.9090	1.0000	0.86631	3.98	5	0.5525
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_HR_T

Source	DF	SS	MS	F	P
subject_n (A)	29	4448.98	153.413		
Attack_Ty (B)	3	32.5196	10.840	0.22	0.8822
Error A*B	87	4285.86	49.263		
Valence_S (C)	1	0.52383	0.524	0.03	0.8721
Error A*C	29	575.646	19.850		
Session (D)	1	9.97345	9.973	0.12	0.7369
Error A*D	29	2513.53	86.674		
B*C	3	125.727	41.909	0.75	0.5278
Error A*B*C	87	4889.85	56.205		
B*D	3	33.3699	11.123	0.30	0.8252
Error A*B*D	87	3223.84	37.056		
C*D	1	9.607E-03	0.010	0.00	0.9919
Error A*C*D	29	2672.24	92.146		
B*C*D	3	6.68117	2.227	0.06	0.9825
Error A*B*C*D	87	3468.41	39.867		
Total	479	26287.2			

Grand Mean	1.3461
CV(subject_n*Attack_Ty)	521.42
CV(subject_n*Valence_S)	330.99
CV(subject_n*Session)	691.63
CV(subject_n*Attack_Ty*Valence_S)	556.95
CV(subject_n*Attack_Ty*Session)	452.23
CV(subject_n*Valence_S*Session)	713.13
CV(subject_n*Attack_Ty*Valence_S*Session)	469.07

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.22	0.6425	0.8467	0.8649
Attack_Ty*Valence_S	0.75	0.3949	0.5001	0.5111
Attack_Ty*Session	0.30	0.5880	0.7783	0.7970
Attack_Ty*Valence_S*Session	0.06	0.8148	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8249	0.9078	0.72957	8.74	5	0.1199

subject_n*Attack_Ty*Valence_S	0.3333	0.7951	0.8711	0.61838	13.32	5	0.0205
subject_n*Attack_Ty*Session	0.3333	0.7920	0.8673	0.65400	11.77	5	0.0380
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_EDA_T

Source	DF	SS	MS	F	P
subject_n (A)	29	113.494	3.91358		
Attack_Ty (B)	3	4.207	1.40240	2.31	0.0819
Error A*B	87	52.819	0.60711		
Valence_S (C)	1	0.767	0.76741	1.65	0.2090
Error A*C	29	13.481	0.46485		
Session (D)	1	1.304	1.30388	1.16	0.2896
Error A*D	29	32.498	1.12061		
B*C	3	0.183	0.06085	0.11	0.9562
Error A*B*C	87	49.767	0.57203		
B*D	3	0.814	0.27148	0.45	0.7190
Error A*B*D	87	52.655	0.60523		
C*D	1	0.123	0.12332	0.18	0.6713
Error A*C*D	29	19.462	0.67112		
B*C*D	3	0.659	0.21975	0.55	0.6526
Error A*B*C*D	87	35.058	0.40297		
Total	479	377.292			

Grand Mean	-0.4695
CV(subject_n*Attack_Ty)	-165.96
CV(subject_n*Valence_S)	-145.22
CV(subject_n*Session)	-225.47
CV(subject_n*Attack_Ty*Valence_S)	-161.09
CV(subject_n*Attack_Ty*Session)	-165.70
CV(subject_n*Valence_S*Session)	-174.49
CV(subject_n*Attack_Ty*Valence_S*Session)	-135.21

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	2.31	0.1394	0.0890	0.0819
Attack_Ty*Valence_S	0.11	0.7467	0.8777	0.8887
Attack_Ty*Session	0.45	0.5083	0.6799	0.6981
Attack_Ty*Valence_S*Session	0.55	0.4662	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.9013	1.0000	0.83968	4.84	5	0.4352
subject_n*Attack_Ty*Valence_S	0.3333	0.5925	0.6285	0.37011	27.55	5	0.0000
subject_n*Attack_Ty*Session	0.3333	0.8161	0.8970	0.73175	8.66	5	0.1235
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_PTT_T

Source	DF	SS	MS	F	P
subject_n (A)	29	382590	13192.8		
Attack_Ty (B)	3	32727	10909.1	0.97	0.4084
Error A*B	87	973517	11189.8		
Valence_S (C)	1	3413	3413.3	0.59	0.4480
Error A*C	29	167329	5770.0		
Session (D)	1	15732	15732.3	2.49	0.1257
Error A*D	29	183497	6327.5		
B*C	3	12122	4040.8	0.45	0.7148
Error A*B*C	87	773450	8890.2		
B*D	3	39970	13323.5	2.43	0.0707
Error A*B*D	87	477296	5486.2		
C*D	1	3853	3853.3	0.38	0.5406
Error A*C*D	29	291479	10051.0		
B*C*D	3	13024	4341.2	0.46	0.7092
Error A*B*C*D	87	816608	9386.3		
Total	479	4186607			

Grand Mean	-6.2917
CV(subject_n*Attack_Ty)	-1681.30
CV(subject_n*Valence_S)	-1207.32
CV(subject_n*Session)	-1264.30
CV(subject_n*Attack_Ty*Valence_S)	-1498.62
CV(subject_n*Attack_Ty*Session)	-1177.25
CV(subject_n*Valence_S*Session)	-1593.45
CV(subject_n*Attack_Ty*Valence_S*Session)	-1539.86

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	0.97	0.3316	0.3542	0.3565
Attack_Ty*Valence_S	0.45	0.5055	0.5957	0.6050
Attack_Ty*Session	2.43	0.1300	0.1125	0.1102
Attack_Ty*Valence_S*Session	0.46	0.5018	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.4433	0.4565	0.10432	62.66	5	0.0000
subject_n*Attack_Ty*Valence_S	0.3333	0.5375	0.5644	0.24196	39.34	5	0.0000
subject_n*Attack_Ty*Session	0.3333	0.5072	0.5295	0.17150	48.88	5	0.0000
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for DEL_PTT_T

Source	DF	SS	MS	F	P
subject_n (A)	29	382590	13192.8		
Attack_Ty (B)	3	32727	10909.1	0.97	0.4084
Error A*B	87	973517	11189.8		
Valence_S (C)	1	3413	3413.3	0.59	0.4480
Error A*C	29	167329	5770.0		
Session (D)	1	15732	15732.3	2.49	0.1257
Error A*D	29	183497	6327.5		
B*C	3	12122	4040.8	0.45	0.7148
Error A*B*C	87	773450	8890.2		
B*D	3	39970	13323.5	2.43	0.0707
Error A*B*D	87	477296	5486.2		
C*D	1	3853	3853.3	0.38	0.5406
Error A*C*D	29	291479	10051.0		
B*C*D	3	13024	4341.2	0.46	0.7092
Error A*B*C*D	87	816608	9386.3		
Total	479	4186607			

Grand Mean	-6.2917
CV(subject_n*Attack_Ty)	-1681.30
CV(subject_n*Valence_S)	-1207.32
CV(subject_n*Session)	-1264.30
CV(subject_n*Attack_Ty*Valence_S)	-1498.62
CV(subject_n*Attack_Ty*Session)	-1177.25
CV(subject_n*Valence_S*Session)	-1593.45
CV(subject_n*Attack_Ty*Valence_S*Session)	-1539.86

Greenhouse-Geisser Corrected P-Values for Nonsphericity

	Minimum	Greenhouse Geisser	Huynh Feldt

Source	F	Epsilon P	Epsilon P	Epsilon P
Attack_Ty	0.97	0.3316	0.3542	0.3565
Attack_Ty*Valence_S	0.45	0.5055	0.5957	0.6050
Attack_Ty*Session	2.43	0.1300	0.1125	0.1102
Attack_Ty*Valence_S*Session	0.46	0.5018	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.4433	0.4565	0.10432	62.66	5	0.0000
subject_n*Attack_Ty*Valence_S	0.3333	0.5375	0.5644	0.24196	39.34	5	0.0000
subject_n*Attack_Ty*Session	0.3333	0.5072	0.5295	0.17150	48.88	5	0.0000
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for TLX_Perf

Source	DF	SS	MS	F	P
subject_n (A)	29	8.7268	0.30092		
Attack_Ty (B)	3	3.7941	1.26470	23.57	0.0000
Error A*B	87	4.6676	0.05365		
Valence_S (C)	1	0.0050	0.00501	0.16	0.6949
Error A*C	29	0.9252	0.03190		
Session (D)	1	0.4290	0.42901	11.52	0.0020
Error A*D	29	1.0799	0.03724		
B*C	3	0.0413	0.01377	0.43	0.7298
Error A*B*C	87	2.7654	0.03179		
B*D	3	0.0352	0.01174	0.39	0.7622
Error A*B*D	87	2.6352	0.03029		
C*D	1	0.0023	0.00230	0.05	0.8274
Error A*C*D	29	1.3754	0.04743		
B*C*D	3	0.1249	0.04164	1.93	0.1310
Error A*B*C*D	87	1.8793	0.02160		
Total	479	28.4866			

Grand Mean	0.5320
CV(subject_n*Attack_Ty)	43.54
CV(subject_n*Valence_S)	33.57
CV(subject_n*Session)	36.27
CV(subject_n*Attack_Ty*Valence_S)	33.51
CV(subject_n*Attack_Ty*Session)	32.72
CV(subject_n*Valence_S*Session)	40.94
CV(subject_n*Attack_Ty*Valence_S*Session)	27.63

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	23.57	0.0000	0.0000	0.0000
Attack_Ty*Valence_S	0.43	0.5156	0.7102	0.7298
Attack_Ty*Session	0.39	0.5384	0.7376	0.7583
Attack_Ty*Valence_S*Session	1.93	0.1756	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.6547	0.7018	0.38306	26.60	5	0.0001
subject_n*Attack_Ty*Valence_S	0.3333	0.9039	1.0000	0.81604	5.64	5	0.3433
subject_n*Attack_Ty*Session	0.3333	0.8834	0.9804	0.81968	5.51	5	0.3566
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for TLX_Eff

Source	DF	SS	MS	F	P
subject_n (A)	29	12.7505	0.43967		
Attack_Ty (B)	3	0.5913	0.19712	7.92	0.0001
Error A*B	87	2.1641	0.02487		

Valence_S (C)	1	0.0135	0.01355	1.00	0.3252
Error A*C	29	0.3922	0.01353		
Session (D)	1	0.5638	0.56376	7.90	0.0088
Error A*D	29	2.0708	0.07141		
B*C	3	0.0193	0.00645	0.40	0.7521
Error A*B*C	87	1.3967	0.01605		
B*D	3	0.0120	0.00399	0.22	0.8851
Error A*B*D	87	1.6079	0.01848		
C*D	1	0.0158	0.01576	0.88	0.3566
Error A*C*D	29	0.5207	0.01795		
B*C*D	3	0.0515	0.01716	1.21	0.3093
Error A*B*C*D	87	1.2290	0.01413		
Total	479	23.3991			

Grand Mean	0.5930
CV(subject_n*Attack_Ty)	26.60
CV(subject_n*Valence_S)	19.61
CV(subject_n*Session)	45.06
CV(subject_n*Attack_Ty*Valence_S)	21.37
CV(subject_n*Attack_Ty*Session)	22.92
CV(subject_n*Valence_S*Session)	22.59
CV(subject_n*Attack_Ty*Valence_S*Session)	20.04

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	7.92	0.0087	0.0007	0.0005
Attack_Ty*Valence_S	0.40	0.5312	0.7054	0.7236
Attack_Ty*Session	0.22	0.6456	0.7916	0.8055
Attack_Ty*Valence_S*Session	1.21	0.2795	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7102	0.7681	0.43640	22.99	5	0.0003
subject_n*Attack_Ty*Valence_S	0.3333	0.7907	0.8658	0.63894	12.42	5	0.0295
subject_n*Attack_Ty*Session	0.3333	0.6226	0.6638	0.31105	32.37	5	0.0000
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Repeated Measures AOV Table for TLX_Frus

Source	DF	SS	MS	F	P
subject_n (A)	29	18.1495	0.62584		
Attack_Ty (B)	3	3.3848	1.12826	34.93	0.0000
Error A*B	87	2.8101	0.03230		
Valence_S (C)	1	0.0949	0.09492	3.00	0.0940
Error A*C	29	0.9184	0.03167		
Session (D)	1	0.1317	0.13167	1.59	0.2173
Error A*D	29	2.4004	0.08277		
B*C	3	0.0686	0.02285	1.19	0.3165
Error A*B*C	87	1.6638	0.01912		
B*D	3	0.0278	0.00927	0.46	0.7123
Error A*B*D	87	1.7608	0.02024		
C*D	1	0.0135	0.01355	0.34	0.5650
Error A*C*D	29	1.1597	0.03999		
B*C*D	3	0.0118	0.00395	0.15	0.9286
Error A*B*C*D	87	2.2705	0.02610		
Total	479	34.8662			

Grand Mean	0.5122
CV(subject_n*Attack_Ty)	35.09
CV(subject_n*Valence_S)	34.74
CV(subject_n*Session)	56.17
CV(subject_n*Attack_Ty*Valence_S)	27.00
CV(subject_n*Attack_Ty*Session)	27.78
CV(subject_n*Valence_S*Session)	39.04
CV(subject_n*Attack_Ty*Valence_S*Session)	31.54

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	34.93	0.0000	0.0000	0.0000
Attack_Ty*Valence_S	1.19	0.2833	0.3162	0.3165
Attack_Ty*Session	0.46	0.5039	0.6849	0.7043
Attack_Ty*Valence_S*Session	0.15	0.7001	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7385	0.8023	0.56205	15.97	5	0.0069
subject_n*Attack_Ty*Valence_S	0.3333	0.9636	1.0000	0.94467	1.58	5	0.9039
subject_n*Attack_Ty*Session	0.3333	0.8657	0.9584	0.76468	7.44	5	0.1901
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for TLX_TD

Source	DF	SS	MS	F	P
subject_n (A)	29	11.8324	0.40801		
Attack_Ty (B)	3	0.9305	0.31017	15.00	0.0000
Error A*B	87	1.7993	0.02068		
Valence_S (C)	1	0.0596	0.05963	2.62	0.1165
Error A*C	29	0.6605	0.02278		
Session (D)	1	0.3440	0.34401	5.56	0.0253
Error A*D	29	1.7937	0.06185		
B*C	3	0.1348	0.04495	3.76	0.0137
Error A*B*C	87	1.0406	0.01196		
B*D	3	0.0468	0.01560	1.24	0.2988
Error A*B*D	87	1.0912	0.01254		
C*D	1	0.0050	0.00501	0.36	0.5544
Error A*C*D	29	0.4058	0.01399		
B*C*D	3	0.0229	0.00763	0.67	0.5753
Error A*B*C*D	87	0.9970	0.01146		
Total	479	21.1641			

Grand Mean	0.5430
CV(subject_n*Attack_Ty)	26.48
CV(subject_n*Valence_S)	27.79
CV(subject_n*Session)	45.80
CV(subject_n*Attack_Ty*Valence_S)	20.14
CV(subject_n*Attack_Ty*Session)	20.62
CV(subject_n*Valence_S*Session)	21.78
CV(subject_n*Attack_Ty*Valence_S*Session)	19.71

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	15.00	0.0006	0.0000	0.0000
Attack_Ty*Valence_S	3.76	0.0623	0.0206	0.0171
Attack_Ty*Session	1.24	0.2739	0.2976	0.2983
Attack_Ty*Valence_S*Session	0.67	0.4212	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8257	0.9088	0.74963	7.99	5	0.1569
subject_n*Attack_Ty*Valence_S	0.3333	0.8198	0.9015	0.73935	8.37	5	0.1369
subject_n*Attack_Ty*Session	0.3333	0.7615	0.8301	0.64024	12.36	5	0.0302
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for TLX_PD

Source	DF	SS	MS	F	P
subject_n (A)	29	16.4948	0.56879		
Attack_Ty (B)	3	0.4057	0.13523	6.93	0.0003
Error A*B	87	1.6970	0.01951		
Valence_S (C)	1	0.0004	0.00042	0.02	0.8916
Error A*C	29	0.6469	0.02231		
Session (D)	1	0.0490	0.04901	0.98	0.3313
Error A*D	29	1.4558	0.05020		
B*C	3	0.0252	0.00839	0.67	0.5753
Error A*B*C	87	1.0968	0.01261		
B*D	3	0.0268	0.00892	1.07	0.3645
Error A*B*D	87	0.7228	0.00831		
C*D	1	0.0105	0.01055	0.51	0.4823
Error A*C*D	29	0.6037	0.02082		
B*C*D	3	0.0264	0.00880	0.69	0.5576
Error A*B*C*D	87	1.1013	0.01266		
Total	479	24.3631			

Grand Mean	0.3691
CV(subject_n*Attack_Ty)	37.84
CV(subject_n*Valence_S)	40.47
CV(subject_n*Session)	60.71
CV(subject_n*Attack_Ty*Valence_S)	30.42
CV(subject_n*Attack_Ty*Session)	24.70
CV(subject_n*Valence_S*Session)	39.09
CV(subject_n*Attack_Ty*Valence_S*Session)	30.49

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	6.93	0.0134	0.0013	0.0009
Attack_Ty*Valence_S	0.67	0.4212	0.5486	0.5623
Attack_Ty*Session	1.07	0.3086	0.3574	0.3611
Attack_Ty*Valence_S*Session	0.69	0.4113	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7477	0.8135	0.55005	16.57	5	0.0054
subject_n*Attack_Ty*Valence_S	0.3333	0.8292	0.9132	0.75564	7.77	5	0.1695
subject_n*Attack_Ty*Session	0.3333	0.8239	0.9066	0.72111	9.06	5	0.1065
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for TLX_MD

Source	DF	SS	MS	F	P
subject_n (A)	29	15.0392	0.51859		
Attack_Ty (B)	3	0.6401	0.21335	12.97	0.0000
Error A*B	87	1.4313	0.01645		
Valence_S (C)	1	0.0057	0.00567	0.32	0.5758
Error A*C	29	0.5135	0.01771		
Session (D)	1	0.4533	0.45326	6.17	0.0190
Error A*D	29	2.1291	0.07342		
B*C	3	0.1054	0.03514	2.09	0.1072
Error A*B*C	87	1.4622	0.01681		
B*D	3	0.0235	0.00784	0.49	0.6936
Error A*B*D	87	1.4060	0.01616		
C*D	1	0.0004	0.00042	0.02	0.8844
Error A*C*D	29	0.5682	0.01959		
B*C*D	3	0.0484	0.01614	0.89	0.4502

Error A*B*C*D	87	1.5798	0.01816
Total	479	25.4062	

Grand Mean	0.5378
CV(subject_n*Attack_Ty)	23.85
CV(subject_n*Valence_S)	24.74
CV(subject_n*Session)	50.38
CV(subject_n*Attack_Ty*Valence_S)	24.11
CV(subject_n*Attack_Ty*Session)	23.64
CV(subject_n*Valence_S*Session)	26.03
CV(subject_n*Attack_Ty*Valence_S*Session)	25.06

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	12.97	0.0012	0.0000	0.0000
Attack_Ty*Valence_S	2.09	0.1589	0.1237	0.1181
Attack_Ty*Session	0.49	0.4917	0.6438	0.6599
Attack_Ty*Valence_S*Session	0.89	0.3535	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8934	0.9930	0.84406	4.70	5	0.4536
subject_n*Attack_Ty*Valence_S	0.3333	0.7789	0.8514	0.62807	12.89	5	0.0244
subject_n*Attack_Ty*Session	0.3333	0.7652	0.8346	0.60670	13.85	5	0.0166
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for pre_Aff_s

Source	DF	SS	MS	F	P
subject_n (A)	29	331.67	11.4369		
Attack_Ty (B)	3	203.01	67.6687	21.66	0.0000
Error A*B	87	271.81	3.1242		
Valence_S (C)	1	0.02	0.0187	0.00	0.9611
Error A*C	29	224.42	7.7386		
Session (D)	1	13.67	13.6688	2.29	0.1412
Error A*D	29	173.27	5.9748		
B*C	3	5.16	1.7187	0.69	0.5624
Error A*B*C	87	217.66	2.5018		
B*D	3	5.87	1.9576	1.05	0.3753
Error A*B*D	87	162.44	1.8671		
C*D	1	5.00	5.0021	2.42	0.1306
Error A*C*D	29	59.94	2.0667		
B*C*D	3	13.21	4.4021	2.77	0.0462
Error A*B*C*D	87	138.11	1.5874		
Total	479	1825.23			

Grand Mean	5.3812
CV(subject_n*Attack_Ty)	32.85
CV(subject_n*Valence_S)	51.69
CV(subject_n*Session)	45.42
CV(subject_n*Attack_Ty*Valence_S)	29.39
CV(subject_n*Attack_Ty*Session)	25.39
CV(subject_n*Valence_S*Session)	26.72
CV(subject_n*Attack_Ty*Valence_S*Session)	23.41

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon

Source	F	P	P	P
Attack_Ty	21.66	0.0001	0.0000	0.0000
Attack_Ty*Valence_S	0.69	0.4140	0.5338	0.5466
Attack_Ty*Session	1.05	0.3143	0.3735	0.3753
Attack_Ty*Valence_S*Session	2.77	0.1066	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8886	0.9870	0.82980	5.17	5	0.3953
subject_n*Attack_Ty*Valence_S	0.3333	0.8114	0.8912	0.69913	9.92	5	0.0775
subject_n*Attack_Ty*Session	0.3333	0.9538	1.0000	0.93380	1.90	5	0.8630
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for pre_af~01

Source	DF	SS	MS	F	P
subject_n (A)	29	288.50	9.95		
Attack_Ty (B)	3	25.94	8.65	2.90	0.0394
Error A*B	87	259.18	2.98		
Valence_S (C)	1	1717.63	1717.63	154.46	0.0000
Error A*C	29	322.49	11.12		
Session (D)	1	0.30	0.30	0.29	0.5948
Error A*D	29	30.07	1.04		
B*C	3	73.22	24.41	9.51	0.0000
Error A*B*C	87	223.16	2.57		
B*D	3	1.72	0.57	0.49	0.6928
Error A*B*D	87	102.41	1.18		
C*D	1	0.01	0.01	0.00	0.9515
Error A*C*D	29	64.12	2.21		
B*C*D	3	4.37	1.46	1.51	0.2175
Error A*B*C*D	87	84.00	0.97		
Total	479	3197.12			

Grand Mean	4.8125
CV(subject_n*Attack_Ty)	35.87
CV(subject_n*Valence_S)	69.29
CV(subject_n*Session)	21.16
CV(subject_n*Attack_Ty*Valence_S)	33.28
CV(subject_n*Attack_Ty*Session)	22.54
CV(subject_n*Valence_S*Session)	30.90
CV(subject_n*Attack_Ty*Valence_S*Session)	20.42

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	2.90	0.0991	0.0399	0.0394
Attack_Ty*Valence_S	9.51	0.0044	0.0000	0.0000
Attack_Ty*Session	0.49	0.4912	0.6494	0.6663
Attack_Ty*Valence_S*Session	1.51	0.2290	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.9908	1.0000	0.98580	0.40	5	0.9954
subject_n*Attack_Ty*Valence_S	0.3333	0.9017	1.0000	0.83757	4.91	5	0.4265
subject_n*Attack_Ty*Session	0.3333	0.7918	0.8671	0.66545	11.29	5	0.0459
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

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Repeated Measures AOV Table for post_Aff_

Source	DF	SS	MS	F	P
subject_n (A)	29	532.31	18.3555		
Attack_Ty (B)	3	30.17	10.0576	4.30	0.0071
Error A*B	87	203.51	2.3392		
Valence_S (C)	1	2.55	2.5521	0.99	0.3280
Error A*C	29	74.76	2.5779		
Session (D)	1	2.55	2.5521	0.66	0.4229
Error A*D	29	112.01	3.8624		
B*C	3	5.57	1.8576	1.48	0.2244
Error A*B*C	87	108.86	1.2513		
B*D	3	1.51	0.5021	0.33	0.8042
Error A*B*D	87	132.68	1.5251		
C*D	1	0.10	0.1021	0.08	0.7784
Error A*C*D	29	36.71	1.2659		
B*C*D	3	5.76	1.9188	1.32	0.2721
Error A*B*C*D	87	126.18	1.4504		
Total	479	1375.25			

Grand Mean	5.7271
CV(subject_n*Attack_Ty)	26.71
CV(subject_n*Valence_S)	28.04
CV(subject_n*Session)	34.32
CV(subject_n*Attack_Ty*Valence_S)	19.53
CV(subject_n*Attack_Ty*Session)	21.56
CV(subject_n*Valence_S*Session)	19.65
CV(subject_n*Attack_Ty*Valence_S*Session)	21.03

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	4.30	0.0471	0.0111	0.0087
Attack_Ty*Valence_S	1.48	0.2329	0.2309	0.2282
Attack_Ty*Session	0.33	0.5705	0.7841	0.8042
Attack_Ty*Valence_S*Session	1.32	0.2595	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8385	0.9247	0.73180	8.66	5	0.1236
subject_n*Attack_Ty*Valence_S	0.3333	0.8144	0.8949	0.70484	9.70	5	0.0843
subject_n*Attack_Ty*Session	0.3333	0.9039	1.0000	0.85458	4.36	5	0.4993
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

4.

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Repeated Measures AOV Table for post_A~01

Source	DF	SS	MS	F	P
subject_n (A)	29	373.22	12.870		
Attack_Ty (B)	3	306.38	102.125	29.08	0.0000
Error A*B	87	305.50	3.511		
Valence_S (C)	1	23.41	23.408	11.97	0.0017
Error A*C	29	56.72	1.956		
Session (D)	1	7.50	7.500	2.13	0.1547
Error A*D	29	101.87	3.513		
B*C	3	5.47	1.825	0.74	0.5337
Error A*B*C	87	215.90	2.482		
B*D	3	3.65	1.217	0.68	0.5661
Error A*B*D	87	155.48	1.787		
C*D	1	2.13	2.133	1.37	0.2518
Error A*C*D	29	45.24	1.560		
B*C*D	3	6.98	2.328	0.95	0.4222
Error A*B*C*D	87	214.14	2.461		
Total	479	1823.59			

Grand Mean	4.9292
CV(subject_n*Attack_Ty)	38.02
CV(subject_n*Valence_S)	28.37
CV(subject_n*Session)	38.02
CV(subject_n*Attack_Ty*Valence_S)	31.96

CV(subject_n*Attack_Ty*Session)	27.12
CV(subject_n*Valence_S*Session)	25.34
CV(subject_n*Attack_Ty*Valence_S*Session)	31.83

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	29.08	0.0000	0.0000	0.0000
Attack_Ty*Valence_S	0.74	0.3982	0.5252	0.5337
Attack_Ty*Session	0.68	0.4160	0.5431	0.5568
Attack_Ty*Valence_S*Session	0.95	0.3389	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7580	0.8259	0.64635	12.10	5	0.0335
subject_n*Attack_Ty*Valence_S	0.3333	0.9336	1.0000	0.90082	2.90	5	0.7161
subject_n*Attack_Ty*Session	0.3333	0.8471	0.9353	0.75388	7.83	5	0.1657
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

5.

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Repeated Measures AOV Table for pre_Aff_g

Source	DF	SS	MS	F	P
subject_n (A)	29	591.62	20.4006		
Attack_Ty (B)	3	291.87	97.2917	23.13	0.0000
Error A*B	87	366.00	4.2069		
Valence_S (C)	1	0.53	0.5333	0.05	0.8308
Error A*C	29	332.84	11.4773		
Session (D)	1	49.41	49.4083	6.14	0.0193
Error A*D	29	233.47	8.0506		
B*C	3	9.52	3.1722	0.62	0.6026
Error A*B*C	87	443.61	5.0989		
B*D	3	5.71	1.9028	0.76	0.5178
Error A*B*D	87	216.92	2.4933		
C*D	1	6.53	6.5333	2.61	0.1170
Error A*C*D	29	72.59	2.5032		
B*C*D	3	10.55	3.5167	1.52	0.2141
Error A*B*C*D	87	200.82	2.3083		
Total	479	2831.99			

Grand Mean	5.6708
CV(subject_n*Attack_Ty)	36.17
CV(subject_n*Valence_S)	59.74
CV(subject_n*Session)	50.03
CV(subject_n*Attack_Ty*Valence_S)	39.82
CV(subject_n*Attack_Ty*Session)	27.84
CV(subject_n*Valence_S*Session)	27.90
CV(subject_n*Attack_Ty*Valence_S*Session)	26.79

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	23.13	0.0000	0.0000	0.0000
Attack_Ty*Valence_S	0.62	0.4367	0.5752	0.5902
Attack_Ty*Session	0.76	0.3895	0.5114	0.5178
Attack_Ty*Valence_S*Session	1.52	0.2270	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8770	0.9724	0.79326	6.42	5	0.2674
subject_n*Attack_Ty*Valence_S	0.3333	0.8375	0.9234	0.71111	9.45	5	0.0924
subject_n*Attack_Ty*Session	0.3333	0.9462	1.0000	0.90962	2.63	5	0.7574
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

6.

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Repeated Measures AOV Table for pre_Af~02

Source	DF	SS	MS	F	P
subject_n (A)	29	290.46	10.02		
Attack_Ty (B)	3	45.32	15.11	5.09	0.0027
Error A*B	87	258.11	2.97		
Valence_S (C)	1	2674.35	2674.35	209.35	0.0000
Error A*C	29	370.46	12.77		
Session (D)	1	2.85	2.85	2.81	0.1046
Error A*D	29	29.46	1.02		
B*C	3	95.16	31.72	12.61	0.0000
Error A*B*C	87	218.78	2.51		
B*D	3	1.92	0.64	0.56	0.6426
Error A*B*D	87	99.51	1.14		
C*D	1	0.05	0.05	0.03	0.8649
Error A*C*D	29	51.26	1.77		
B*C*D	3	0.99	0.33	0.39	0.7637
Error A*B*C*D	87	74.45	0.86		
Total	479	4213.15			

Grand Mean	4.7771
CV(subject_n*Attack_Ty)	36.06
CV(subject_n*Valence_S)	74.82
CV(subject_n*Session)	21.10
CV(subject_n*Attack_Ty*Valence_S)	33.20
CV(subject_n*Attack_Ty*Session)	22.39
CV(subject_n*Valence_S*Session)	27.83
CV(subject_n*Attack_Ty*Valence_S*Session)	19.36

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	5.09	0.0317	0.0043	0.0030
Attack_Ty*Valence_S	12.61	0.0013	0.0000	0.0000
Attack_Ty*Session	0.56	0.4601	0.6133	0.6299
Attack_Ty*Valence_S*Session	0.39	0.5395	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8752	0.9703	0.76575	7.40	5	0.1926
subject_n*Attack_Ty*Valence_S	0.3333	0.8116	0.8915	0.69932	9.91	5	0.0777
subject_n*Attack_Ty*Session	0.3333	0.8415	0.9284	0.67676	10.82	5	0.0550
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

7.

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Repeated Measures AOV Table for post_A~02

Source	DF	SS	MS	F	P
subject_n (A)	29	1101.34	37.9771		
Attack_Ty (B)	3	40.07	13.3576	6.86	0.0003
Error A*B	87	169.49	1.9482		
Valence_S (C)	1	0.25	0.2521	0.09	0.7687
Error A*C	29	82.94	2.8598		
Session (D)	1	18.02	18.0187	3.87	0.0587
Error A*D	29	134.92	4.6524		
B*C	3	5.77	1.9243	1.02	0.3869
Error A*B*C	87	163.79	1.8826		
B*D	3	2.64	0.8799	0.42	0.7422
Error A*B*D	87	184.17	2.1169		
C*D	1	0.25	0.2521	0.13	0.7185
Error A*C*D	29	55.19	1.9029		
B*C*D	3	4.04	1.3465	0.70	0.5519
Error A*B*C*D	87	166.27	1.9112		
Total	479	2129.15			

Grand Mean	5.8896
CV(subject_n*Attack_Ty)	23.70
CV(subject_n*Valence_S)	28.71
CV(subject_n*Session)	36.62
CV(subject_n*Attack_Ty*Valence_S)	23.30
CV(subject_n*Attack_Ty*Session)	24.70
CV(subject_n*Valence_S*Session)	23.42
CV(subject_n*Attack_Ty*Valence_S*Session)	23.47

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	6.86	0.0139	0.0010	0.0006
Attack_Ty*Valence_S	1.02	0.3204	0.3749	0.3794
Attack_Ty*Session	0.42	0.5242	0.7048	0.7238
Attack_Ty*Valence_S*Session	0.70	0.4081	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8044	0.8826	0.70176	9.82	5	0.0806
subject_n*Attack_Ty*Valence_S	0.3333	0.7815	0.8546	0.68303	10.57	5	0.0606
subject_n*Attack_Ty*Session	0.3333	0.8268	0.9102	0.74516	8.15	5	0.1479
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

8.

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Repeated Measures AOV Table for post_A~03

Source	DF	SS	MS	F	P
subject_n (A)	29	609.24	21.008		
Attack_Ty (B)	3	431.54	143.847	31.08	0.0000
Error A*B	87	402.71	4.629		
Valence_S (C)	1	21.67	21.675	10.17	0.0034
Error A*C	29	61.82	2.132		
Session (D)	1	10.21	10.208	2.66	0.1137
Error A*D	29	111.29	3.838		
B*C	3	4.17	1.392	0.49	0.6870
Error A*B*C	87	244.82	2.814		
B*D	3	1.64	0.547	0.20	0.8934
Error A*B*D	87	233.36	2.682		
C*D	1	1.88	1.875	0.93	0.3425
Error A*C*D	29	58.37	2.013		
B*C*D	3	11.01	3.669	1.26	0.2930
Error A*B*C*D	87	253.24	2.911		
Total	479	2456.99			

Grand Mean	5.0792
CV(subject_n*Attack_Ty)	42.36
CV(subject_n*Valence_S)	28.75
CV(subject_n*Session)	38.57
CV(subject_n*Attack_Ty*Valence_S)	33.03
CV(subject_n*Attack_Ty*Session)	32.24
CV(subject_n*Valence_S*Session)	27.93
CV(subject_n*Attack_Ty*Valence_S*Session)	33.59

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	31.08	0.0000	0.0000	0.0000
Attack_Ty*Valence_S	0.49	0.4875	0.6755	0.6870
Attack_Ty*Session	0.20	0.6549	0.8568	0.8743
Attack_Ty*Valence_S*Session	1.26	0.2707	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8074	0.8863	0.70482	9.70	5	0.0843
subject_n*Attack_Ty*Valence_S	0.3333	0.9396	1.0000	0.90402	2.80	5	0.7312
subject_n*Attack_Ty*Session	0.3333	0.8157	0.8964	0.68447	10.51	5	0.0620

subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

9.

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Repeated Measures AOV Table for pre_PANAS

Source	**DF**	**SS**	**MS**	**F**	**P**
subject_n (A)	29	9155.3	315.70		
Attack_Ty (B)	3	382.5	127.50	9.71	0.0000
Error A*B	87	1142.6	13.13		
Valence_S (C)	1	2847.0	2847.00	35.96	0.0000
Error A*C	29	2295.7	79.16		
Session (D)	1	68.3	68.25	3.28	0.0804
Error A*D	29	602.9	20.79		
B*C	3	483.4	161.14	14.39	0.0000
Error A*B*C	87	974.1	11.20		
B*D	3	6.8	2.27	0.43	0.7302
Error A*B*D	87	456.3	5.24		
C*D	1	103.6	103.60	7.81	0.0091
Error A*C*D	29	384.6	13.26		
B*C*D	3	9.7	3.22	0.47	0.7059
Error A*B*C*D	87	599.4	6.89		
Total	479	19512.1			

Grand Mean	14.590
CV(subject_n*Attack_Ty)	24.84
CV(subject_n*Valence_S)	60.98
CV(subject_n*Session)	31.25
CV(subject_n*Attack_Ty*Valence_S)	22.94
CV(subject_n*Attack_Ty*Session)	15.70
CV(subject_n*Valence_S*Session)	24.96
CV(subject_n*Attack_Ty*Valence_S*Session)	17.99

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	**F**	**Minimum Epsilon P**	**Greenhouse Geisser Epsilon P**	**Huynh Feldt Epsilon P**
Attack_Ty	9.71	0.0041	0.0001	0.0000
Attack_Ty*Valence_S	14.39	0.0007	0.0000	0.0000
Attack_Ty*Session	0.43	0.5159	0.7141	0.7302
Attack_Ty*Valence_S*Session	0.47	0.4997	M	M

Sphericity Assumption Tests

Source	**Minimum Epsilon**	**Greenhouse Geisser Epsilon**	**Huynh Feldt Epsilon**	**Mauchly's Statistic**	**Chi Sq**	**DF**	**P**
subject_n*Attack_Ty	0.3333	0.8116	0.8915	0.65522	11.72	5	0.0388
subject_n*Attack_Ty*Valence_S	0.3333	0.8950	0.9950	0.84424	4.69	5	0.4544
subject_n*Attack_Ty*Session	0.3333	0.9204	1.0000	0.85863	4.23	5	0.5174
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

10.

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Repeated Measures AOV Table for pre_PA~01

Source	**DF**	**SS**	**MS**	**F**	**P**
subject_n (A)	29	34311.9	1183.17		
Attack_Ty (B)	3	1128.7	376.25	13.85	0.0000
Error A*B	87	2364.1	27.17		
Valence_S (C)	1	755.0	755.01	18.22	0.0002
Error A*C	29	1201.9	41.44		
Session (D)	1	580.8	580.80	9.74	0.0041
Error A*D	29	1728.6	59.61		
B*C	3	599.2	199.72	5.76	0.0012
Error A*B*C	87	3018.0	34.69		
B*D	3	2.4	0.82	0.11	0.9568
Error A*B*D	87	675.2	7.76		

C*D	1	7.5	7.50	0.94	0.3411
Error A*C*D	29	232.1	8.00		
B*C*D	3	16.8	5.62	0.53	0.6658
Error A*B*C*D	87	929.5	10.68		
Total	479	47551.8			

Grand Mean	22.854
CV(subject_n*Attack_Ty)	22.81
CV(subject_n*Valence_S)	28.17
CV(subject_n*Session)	33.78
CV(subject_n*Attack_Ty*Valence_S)	25.77
CV(subject_n*Attack_Ty*Session)	12.19
CV(subject_n*Valence_S*Session)	12.38
CV(subject_n*Attack_Ty*Valence_S*Session)	14.30

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	13.85	0.0008	0.0000	0.0000
Attack_Ty*Valence_S	5.76	0.0231	0.0024	0.0017
Attack_Ty*Session	0.11	0.7480	0.9367	0.9491
Attack_Ty*Valence_S*Session	0.53	0.4742	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.7356	0.7988	0.54949	16.60	5	0.0053
subject_n*Attack_Ty*Valence_S	0.3333	0.8406	0.9272	0.72734	8.83	5	0.1162
subject_n*Attack_Ty*Session	0.3333	0.8451	0.9328	0.72109	9.06	5	0.1065
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

11.

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Repeated Measures AOV Table for post_PANA

Source	DF	SS	MS	F	P
subject_n (A)	29	8681.7	299.370		
Attack_Ty (B)	3	714.7	238.225	17.20	0.0000
Error A*B	87	1205.2	13.853		
Valence_S (C)	1	102.7	102.675	11.00	0.0025
Error A*C	29	270.7	9.334		
Session (D)	1	12.7	12.675	1.26	0.2708
Error A*D	29	291.7	10.059		
B*C	3	28.5	9.503	1.15	0.3331
Error A*B*C	87	718.1	8.254		
B*D	3	28.3	9.436	1.79	0.1555
Error A*B*D	87	459.3	5.280		
C*D	1	5.2	5.208	0.62	0.4373
Error A*C*D	29	243.4	8.394		
B*C*D	3	11.5	3.847	0.78	0.5080
Error A*B*C*D	87	428.8	4.929		
Total	479	13202.6			

Grand Mean	14.446
CV(subject_n*Attack_Ty)	25.76
CV(subject_n*Valence_S)	21.15
CV(subject_n*Session)	21.95
CV(subject_n*Attack_Ty*Valence_S)	19.89
CV(subject_n*Attack_Ty*Session)	15.91
CV(subject_n*Valence_S*Session)	20.06
CV(subject_n*Attack_Ty*Valence_S*Session)	15.37

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	17.20	0.0003	0.0000	0.0000
Attack_Ty*Valence_S	1.15	0.2921	0.3294	0.3314
Attack_Ty*Session	1.79	0.1916	0.1594	0.1555
Attack_Ty*Valence_S*Session	0.78	0.3843	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.6053	0.6434	0.29921	33.45	5	0.0000
subject_n*Attack_Ty*Valence_S	0.3333	0.8274	0.9109	0.67519	10.89	5	0.0536
subject_n*Attack_Ty*Session	0.3333	0.9369	1.0000	0.89840	2.97	5	0.7046
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

12.

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Repeated Measures AOV Table for post_P~01

Source	DF	SS	MS	F	P
subject_n (A)	29	43441.4	1497.98		
Attack_Ty (B)	3	861.8	287.27	11.12	0.0000
Error A*B	87	2246.9	25.83		
Valence_S (C)	1	50.7	50.70	2.57	0.1200
Error A*C	29	572.8	19.75		
Session (D)	1	644.0	644.03	9.47	0.0045
Error A*D	29	1973.0	68.03		
B*C	3	34.8	11.58	0.59	0.6228
Error A*B*C	87	1706.3	19.61		
B*D	3	6.3	2.09	0.13	0.9444
Error A*B*D	87	1444.2	16.60		
C*D	1	2.1	2.13	0.11	0.7447
Error A*C*D	29	572.6	19.75		
B*C*D	3	2.5	0.83	0.05	0.9860
Error A*B*C*D	87	1501.3	17.26		
Total	479	55060.7			

Grand Mean	25.833
CV(subject_n*Attack_Ty)	19.67
CV(subject_n*Valence_S)	17.20
CV(subject_n*Session)	31.93
CV(subject_n*Attack_Ty*Valence_S)	17.14
CV(subject_n*Attack_Ty*Session)	15.77
CV(subject_n*Valence_S*Session)	17.20
CV(subject_n*Attack_Ty*Valence_S*Session)	16.08

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	11.12	0.0023	0.0000	0.0000
Attack_Ty*Valence_S	0.59	0.4484	0.6106	0.6228
Attack_Ty*Session	0.13	0.7250	0.9289	0.9428
Attack_Ty*Valence_S*Session	0.05	0.8282	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
subject_n*Attack_Ty	0.3333	0.8646	0.9570	0.76985	7.25	5	0.2026
subject_n*Attack_Ty*Valence_S	0.3333	0.9280	1.0000	0.88365	3.43	5	0.6341
subject_n*Attack_Ty*Session	0.3333	0.8890	0.9874	0.81402	5.70	5	0.3360
subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

//

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Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P
Age_L (A)	2	6.993E+08	3.496E+08	0.87	0.4304
subject_n (B)					
Error A*B	23	9.195E+09	3.998E+08		
Attack_Ty (C)	3	4.680E+10	1.560E+10	64.22	0.0000
A*C	6	3.612E+09	6.020E+08	2.48	0.0314
Error A*B*C	69	1.676E+10	2.429E+08		
Valence_S (D)	1	2.658E+08	2.658E+08	1.26	0.2732
A*D	2	1.529E+08	7.645E+07	0.36	0.6999
Error A*B*D	23	4.851E+09	2.109E+08		
Session (E)	1	2.421E+09	2.421E+09	11.31	0.0027
A*E	2	3.781E+08	1.891E+08	0.88	0.4270
Error A*B*E	23	4.924E+09	2.141E+08		
C*D	3	2.285E+08	7.618E+07	0.36	0.7845
A*C*D	6	1.135E+09	1.891E+08	0.89	0.5107
Error A*B*C*D	69	1.474E+10	2.136E+08		
C*E	3	2.404E+08	8.013E+07	0.29	0.8345
A*C*E	6	8.343E+08	1.391E+08	0.50	0.8074
Error A*B*C*E	69	1.925E+10	2.790E+08		
D*E	1	7.678E+08	7.678E+08	3.05	0.0943
A*D*E	2	2.539E+08	1.269E+08	0.50	0.6109
Error A*B*D*E	23	5.798E+09	2.521E+08		
C*D*E	3	8.999E+08	3.000E+08	2.42	0.0735
A*C*D*E	6	6.421E+08	1.070E+08	0.86	0.5265
Error A*B*C*D*E	69	8.556E+09	1.240E+08		
Total	415				

Note: SS are marginal (type III) sums of squares

Grand Mean	-8577.7
CV(Age_L*subject_n)	-233.09
CV(Age_L*subject_n*Attack_Ty)	-181.69
CV(Age_L*subject_n*Valence_S)	-169.30
CV(Age_L*subject_n*Session)	-170.57
CV(Age_L*subject_n*Attack_Ty*Valence_S)	-170.40
CV(Age_L*subject_n*Attack_Ty*Session)	-194.72
CV(Age_L*subject_n*Valence_S*Session)	-185.10
CV(Age_L*subject_n*Attack_Ty*Valence_S*Session)	-129.82

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	64.22	0.0000	0.0000	0.0000
Age_L*Attack_Ty	2.48	0.1060	0.0533	0.0413
Attack_Ty*Valence_S	0.36	0.5562	0.7379	0.7780
Age_L*Attack_Ty*Valence_S	0.89	0.4263	0.4934	0.5082
Attack_Ty*Session	0.29	0.5971	0.7635	0.8013
Age_L*Attack_Ty*Session	0.50	0.6139	0.7467	0.7785
Attack_Ty*Valence_S*Session	2.42	0.1335	M	M
Age_L*Attack_Ty*Valence_S*Session	0.86	0.4351	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
Age_L*subject_n*Attack_Ty	0.3333	0.7042	0.8447	0.43833	17.92	5	0.0031
Age_L*subject_n*Attack_Ty*Valence_S	0.3333	0.7930	0.9675	0.66899	8.73	5	0.1202
Age_L*subject_n*Attack_Ty*Session	0.3333	0.7044	0.8449	0.53732	13.49	5	0.0192
Age_L*subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Box's Test for Equality of Covariance Matrices

Source	Box's M	F	DF1	DF2	P(F)	Chi Sq	DF	P(Chi Sq)
Age_L*subject_n*Attack_Ty	M							
Age_L*subject_n*Attack_Ty*Valence_S	M							
Age_L*subject_n*Attack_Ty*Session	M							
Age_L*subject_n*Attack_Ty*Valence_S*Session	M							

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Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P
Ed_Yrs_L (A)	2	1.109E+09	5.545E+08	1.50	0.2456

subject_n (B)					
Error A*B	21	7.752E+09	3.691E+08		
Attack_Ty (C)	3	3.909E+10	1.303E+10	43.37	0.0000
A*C	6	1.201E+09	2.002E+08	0.67	0.6769
Error A*B*C	63	1.893E+10	3.004E+08		
Valence_S (D)	1	3.944E+08	3.944E+08	2.03	0.1686
A*D	2	1.586E+08	7.929E+07	0.41	0.6697
Error A*B*D	21	4.074E+09	1.940E+08		
Session (E)	1	3.221E+09	3.221E+09	12.98	0.0017
A*E	2	1.106E+07	5529670	0.02	0.9780
Error A*B*E	21	5.210E+09	2.481E+08		
C*D	3	6.043E+07	2.014E+07	0.10	0.9615
A*C*D	6	5.055E+08	8.425E+07	0.40	0.8732
Error A*B*C*D	63	1.311E+10	2.082E+08		
C*E	3	3.602E+08	1.201E+08	0.51	0.6751
A*C*E	6	3.412E+09	5.686E+08	2.43	0.0357
Error A*B*C*E	63	1.476E+10	2.342E+08		
D*E	1	8.822E+08	8.822E+08	3.78	0.0655
A*D*E	2	5.601E+08	2.801E+08	1.20	0.3213
Error A*B*D*E	21	4.905E+09	2.336E+08		
C*D*E	3	1.141E+09	3.804E+08	3.08	0.0339
A*C*D*E	6	6.307E+08	1.051E+08	0.85	0.5366
Error A*B*C*D*E	63	7.792E+09	1.237E+08		
Total	383				

Note: SS are marginal (type III) sums of squares

Grand Mean	-8278.5
CV(Ed_Yrs_L*subject_n)	-232.08
CV(Ed_Yrs_L*subject_n*Attack_Ty)	-209.37
CV(Ed_Yrs_L*subject_n*Valence_S)	-168.25
CV(Ed_Yrs_L*subject_n*Session)	-190.27
CV(Ed_Yrs_L*subject_n*Attack_Ty*Valence_S)	-174.28
CV(Ed_Yrs_L*subject_n*Attack_Ty*Session)	-184.87
CV(Ed_Yrs_L*subject_n*Valence_S*Session)	-184.61
CV(Ed_Yrs_L*subject_n*Attack_Ty*Valence_S*Session)	-134.34

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	43.37	0.0000	0.0000	0.0000
Ed_Yrs_L*Attack_Ty	0.67	0.5241	0.6250	0.6532
Attack_Ty*Valence_S	0.10	0.7588	0.9204	0.9480
Ed_Yrs_L*Attack_Ty*Valence_S	0.40	0.6723	0.8181	0.8530
Attack_Ty*Session	0.51	0.4819	0.6442	0.6751
Ed_Yrs_L*Attack_Ty*Session	2.43	0.1126	0.0465	0.0357
Attack_Ty*Valence_S*Session	3.08	0.0941	M	M
Ed_Yrs_L*Attack_Ty*Valence_S*Session	0.85	0.4417	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
Ed_Yrs_L*subject_n*Attack_Ty	0.3333	0.6965	0.8487	0.26932	25.87	5	0.0001
Ed_Yrs_L*subject_n*Attack_Ty*Valence_S	0.3333	0.7204	0.8824	0.56974	11.10	5	0.0495
Ed_Yrs_L*subject_n*Attack_Ty*Session	0.3333	0.8414	1.0000	0.74670	5.76	5	0.3302
Ed_Yrs_L*subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Box's Test for Equality of Covariance Matrices

Source	Box's M	F	DF1	DF2	P(F)	Chi Sq	DF	P(Chi Sq)
Ed_Yrs_L*subject_n*Attack_Ty	M							
Ed_Yrs_L*subject_n*Attack_Ty*Valence_S	M							
Ed_Yrs_L*subject_n*Attack_Ty*Session	M							
Ed_Yrs_L*subject_n*Attack_Ty*Valence_S*Session	M							

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Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P
M_T_Time_ (A)	2	3.847E+08	1.923E+08	0.45	0.6407
subject_n (B)					
Error A*B	23	9.747E+09	4.238E+08		
Attack_Ty (C)	3	5.812E+10	1.937E+10	66.19	0.0000
A*C	6	7.039E+08	1.173E+08	0.40	0.8761
Error A*B*C	69	2.020E+10	2.927E+08		
Valence_S (D)	1	2.788E+08	2.788E+08	1.22	0.2804
A*D	2	4.042E+08	2.021E+08	0.89	0.4261
Error A*B*D	23	5.249E+09	2.282E+08		
Session (E)	1	4.171E+09	4.171E+09	13.27	0.0014
A*E	2	5.107E+07	2.553E+07	0.08	0.9223
Error A*B*E	23	7.231E+09	3.144E+08		
C*D	3	2.641E+08	8.802E+07	0.49	0.6899
A*C*D	6	1.845E+09	3.075E+08	1.71	0.1307
Error A*B*C*D	69	1.238E+10	1.794E+08		
C*E	3	2.368E+08	7.894E+07	0.29	0.8359
A*C*E	6	1.679E+09	2.799E+08	1.01	0.4253
Error A*B*C*E	69	1.910E+10	2.768E+08		
D*E	1	9.800E+08	9.800E+08	3.43	0.0768
A*D*E	2	9.262E+07	4.631E+07	0.16	0.8513
Error A*B*D*E	23	6.569E+09	2.856E+08		
C*D*E	3	1.252E+09	4.172E+08	3.77	0.0145
A*C*D*E	6	1.625E+09	2.709E+08	2.45	0.0334
Error A*B*C*D*E	69	7.642E+09	1.108E+08		
Total	415				

Note: SS are marginal (type III) sums of squares

Grand Mean	-8464.0
CV(M_T_Time_*subject_n)	-243.21
CV(M_T_Time_*subject_n*Attack_Ty)	-202.14
CV(M_T_Time_*subject_n*Valence_S)	-178.48
CV(M_T_Time_*subject_n*Session)	-209.49
CV(M_T_Time_*subject_n*Attack_Ty*Valence_S)	-158.25
CV(M_T_Time_*subject_n*Attack_Ty*Session)	-196.56
CV(M_T_Time_*subject_n*Valence_S*Session)	-199.66
CV(M_T_Time_*subject_n*Attack_Ty*Valence_S*Session)	-124.34

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	66.19	0.0000	0.0000	0.0000
M_T_Time_*Attack_Ty	0.40	0.6744	0.8231	0.8551
Attack_Ty*Valence_S	0.49	0.4907	0.6450	0.6813
M_T_Time_*Attack_Ty*Valence_S	1.71	0.2024	0.1509	0.1348
Attack_Ty*Session	0.29	0.5984	0.7752	0.8139
M_T_Time_*Attack_Ty*Session	1.01	0.3794	0.4154	0.4218
Attack_Ty*Valence_S*Session	3.77	0.0646	M	M
M_T_Time_*Attack_Ty*Valence_S*Session	2.45	0.1089	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
M_T_Time_*subject_n*Attack_Ty	0.3333	0.7288	0.8784	0.39285	20.30	5	0.0011
M_T_Time_*subject_n*Attack_Ty*Valence_S	0.3333	0.7833	0.9539	0.66329	8.92	5	0.1124
M_T_Time_*subject_n*Attack_Ty*Session	0.3333	0.7394	0.8930	0.61272	10.64	5	0.0590
M_T_Time_*subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Box's Test for Equality of Covariance Matrices

Source	Box's M	F	DF1	DF2	P(F)	Chi Sq	DF	P(Chi Sq)
M_T_Time_*subject_n*Attack_Ty	M							
M_T_Time_*subject_n*Attack_Ty*Valence_S	M							
M_T_Time_*subject_n*Attack_Ty*Session	M							
M_T_Time_*subject_n*Attack_Ty*Valence_S*Session	M							

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Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P
S_T_Time_ (A)	2	3.839E+08	1.919E+08	0.49	0.6174

subject_n (B)					
Error A*B	21	8.167E+09	3.889E+08		
Attack_Ty (C)	3	4.909E+10	1.636E+10	58.45	0.0000
A*C	6	2.051E+09	3.418E+08	1.22	0.3075
Error A*B*C	63	1.764E+10	2.799E+08		
Valence_S (D)	1	6.555E+08	6.555E+08	2.95	0.1009
A*D	2	2.867E+08	1.433E+08	0.64	0.5353
Error A*B*D	21	4.674E+09	2.226E+08		
Session (E)	1	4.685E+09	4.685E+09	17.51	0.0004
A*E	2	2.498E+08	1.249E+08	0.47	0.6335
Error A*B*E	21	5.621E+09	2.677E+08		
C*D	3	3.732E+08	1.244E+08	0.60	0.6195
A*C*D	6	7.711E+08	1.285E+08	0.62	0.7162
Error A*B*C*D	63	1.313E+10	2.085E+08		
C*E	3	3.470E+08	1.157E+08	0.45	0.7200
A*C*E	6	1.794E+09	2.990E+08	1.16	0.3409
Error A*B*C*E	63	1.629E+10	2.585E+08		
D*E	1	1.297E+09	1.297E+09	6.08	0.0224
A*D*E	2	1.720E+09	8.599E+08	4.03	0.0330
Error A*B*D*E	21	4.480E+09	2.134E+08		
C*D*E	3	1.283E+09	4.276E+08	3.34	0.0247
A*C*D*E	6	9.286E+08	1.548E+08	1.21	0.3132
Error A*B*C*D*E	63	8.060E+09	1.279E+08		
Total	383				

Note: SS are marginal (type III) sums of squares

Grand Mean	-8694.1
CV(S_T_Time_*subject_n)	-226.83
CV(S_T_Time_*subject_n*Attack_Ty)	-192.45
CV(S_T_Time_*subject_n*Valence_S)	-171.60
CV(S_T_Time_*subject_n*Session)	-188.17
CV(S_T_Time_*subject_n*Attack_Ty*Valence_S)	-166.07
CV(S_T_Time_*subject_n*Attack_Ty*Session)	-184.94
CV(S_T_Time_*subject_n*Valence_S*Session)	-168.01
CV(S_T_Time_*subject_n*Attack_Ty*Valence_S*Session)	-130.10

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	58.45	0.0000	0.0000	0.0000
S_T_Time_*Attack_Ty	1.22	0.3150	0.3154	0.3114
Attack_Ty*Valence_S	0.60	0.4484	0.5608	0.5919
S_T_Time_*Attack_Ty*Valence_S	0.62	0.5493	0.6587	0.6891
Attack_Ty*Session	0.45	0.5108	0.6717	0.7128
S_T_Time_*Attack_Ty*Session	1.16	0.3338	0.3433	0.3414
Attack_Ty*Valence_S*Session	3.34	0.0818	M	M
S_T_Time_*Attack_Ty*Valence_S*Session	1.21	0.3182	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
S_T_Time_*subject_n*Attack_Ty	0.3333	0.7122	0.8707	0.31345	22.88	5	0.0004
S_T_Time_*subject_n*Attack_Ty*Valence_S	0.3333	0.6912	0.8412	0.51742	12.99	5	0.0234
S_T_Time_*subject_n*Attack_Ty*Session	0.3333	0.7768	0.9628	0.65970	8.20	5	0.1454
S_T_Time_*subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Box's Test for Equality of Covariance Matrices

Source	**Box's M**	**F**	**DF1**	**DF2**	**P(F)**	**Chi Sq**	**DF**	**P(Chi Sq)**
S_T_Time_*subject_n*Attack_Ty	M							
S_T_Time_*subject_n*Attack_Ty*Valence_S	M							
S_T_Time_*subject_n*Attack_Ty*Session	M							
S_T_Time_*subject_n*Attack_Ty*Valence_S*Session	M							

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Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P

No_Prb~01 (A)	2	1.466E+09	7.328E+08	2.22	0.1336
subject_n (B)					
Error A*B	21	6.935E+09	3.303E+08		
Attack_Ty (C)	3	3.461E+10	1.154E+10	43.45	0.0000
A*C	6	2.810E+09	4.683E+08	1.76	0.1210
Error A*B*C	63	1.672E+10	2.655E+08		
Valence_S (D)	1	7.283E+08	7.283E+08	3.52	0.0744
A*D	2	1.080E+08	5.398E+07	0.26	0.7726
Error A*B*D	21	4.339E+09	2.066E+08		
Session (E)	1	2.850E+09	2.850E+09	16.15	0.0006
A*E	2	2.515E+09	1.257E+09	7.12	0.0044
Error A*B*E	21	3.707E+09	1.765E+08		
C*D	3	8.500E+07	2.833E+07	0.13	0.9405
A*C*D	6	2.320E+08	3.866E+07	0.18	0.9812
Error A*B*C*D	63	1.349E+10	2.142E+08		
C*E	3	4.916E+08	1.639E+08	0.64	0.5931
A*C*E	6	1.822E+09	3.037E+08	1.18	0.3269
Error A*B*C*E	63	1.617E+10	2.567E+08		
D*E	1	5.784E+08	5.784E+08	2.36	0.1395
A*D*E	2	4.299E+08	2.150E+08	0.88	0.4309
Error A*B*D*E	21	5.149E+09	2.452E+08		
C*D*E	3	1.331E+09	4.436E+08	3.85	0.0135
A*C*D*E	6	8.491E+08	1.415E+08	1.23	0.3035
Error A*B*C*D*E	63	7.254E+09	1.151E+08		
Total	383				

Note: SS are marginal (type III) sums of squares

Grand Mean	-7565.1
CV(No_Prb~01*subject_n)	-240.22
CV(No_Prb~01*subject_n*Attack_Ty)	-215.37
CV(No_Prb~01*subject_n*Valence_S)	-190.01
CV(No_Prb~01*subject_n*Session)	-175.62
CV(No_Prb~01*subject_n*Attack_Ty*Valence_S)	-193.44
CV(No_Prb~01*subject_n*Attack_Ty*Session)	-211.80
CV(No_Prb~01*subject_n*Valence_S*Session)	-206.99
CV(No_Prb~01*subject_n*Attack_Ty*Valence_S*Session)	-141.84

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	43.45	0.0000	0.0000	0.0000
No_Prb~01*Attack_Ty	1.76	0.1958	0.1480	0.1315
Attack_Ty*Valence_S	0.13	0.7197	0.8944	0.9271
No_Prb~01*Attack_Ty*Valence_S	0.18	0.8361	0.9577	0.9749
Attack_Ty*Session	0.64	0.4333	0.5511	0.5821
No_Prb~01*Attack_Ty*Session	1.18	0.3260	0.3313	0.3283
Attack_Ty*Valence_S*Session	3.85	0.0630	M	M
No_Prb~01*Attack_Ty*Valence_S*Session	1.23	0.3128	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
No_Prb~01*subject_n*Attack_Ty	0.3333	0.7222	0.8849	0.34152	21.19	5	0.0007
No_Prb~01*subject_n*Attack_Ty*Valence_S	0.3333	0.7361	0.9046	0.58294	10.64	5	0.0589
No_Prb~01*subject_n*Attack_Ty*Session	0.3333	0.7531	0.9288	0.62331	9.32	5	0.0969
No_Prb~01*subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Box's Test for Equality of Covariance Matrices

Source	Box's M	F	DF1	DF2	P(F)	Chi Sq	DF	P(Chi Sq)
No_Prb~01*subject_n*Attack_Ty	M							
No_Prb~01*subject_n*Attack_Ty*Valence_S	M							
No_Prb~01*subject_n*Attack_Ty*Session	M							
No_Prb~01*subject_n*Attack_Ty*Valence_S*Session	M							

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Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P
ToT_E_A_L (A)	2	1.041E+09	5.203E+08	1.30	0.2900
subject_n (B)					
Error A*B	27	1.084E+10	4.013E+08		
Attack_Ty (C)	3	6.191E+10	2.064E+10	79.85	0.0000
A*C	6	3.770E+09	6.283E+08	2.43	0.0327
Error A*B*C	81	2.093E+10	2.584E+08		

Valence_S (D)	1	2.461E+08	2.461E+08	1.19	0.2844
A*D	2	3.341E+08	1.671E+08	0.81	0.4555
Error A*B*D	27	5.570E+09	2.063E+08		
Session (E)	1	4.912E+09	4.912E+09	17.57	0.0003
A*E	2	2.025E+07	1.012E+07	0.04	0.9645
Error A*B*E	27	7.550E+09	2.796E+08		
C*D	3	9.047E+07	3.016E+07	0.16	0.9246
A*C*D	6	1.715E+09	2.858E+08	1.49	0.1913
Error A*B*C*D	81	1.552E+10	1.916E+08		
C*E	3	4.267E+08	1.422E+08	0.51	0.6793
A*C*E	6	1.344E+09	2.240E+08	0.80	0.5753
Error A*B*C*E	81	2.277E+10	2.812E+08		
D*E	1	9.832E+08	9.832E+08	4.29	0.0480
A*D*E	2	8.610E+08	4.305E+08	1.88	0.1722
Error A*B*D*E	27	6.187E+09	2.291E+08		
C*D*E	3	1.158E+09	3.861E+08	3.14	0.0298
A*C*D*E	6	1.503E+09	2.504E+08	2.04	0.0703
Error A*B*C*D*E	81	9.968E+09	1.231E+08		
Total	479	1.796E+11			

Grand Mean	-7869.0
CV(ToT_E_A_L*subject_n)	-254.59
CV(ToT_E_A_L*subject_n*Attack_Ty)	-204.29
CV(ToT_E_A_L*subject_n*Valence_S)	-182.53
CV(ToT_E_A_L*subject_n*Session)	-212.51
CV(ToT_E_A_L*subject_n*Attack_Ty*Valence_S)	-175.89
CV(ToT_E_A_L*subject_n*Attack_Ty*Session)	-213.08
CV(ToT_E_A_L*subject_n*Valence_S*Session)	-192.36
CV(ToT_E_A_L*subject_n*Attack_Ty*Valence_S*Session)	-140.97

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	79.85	0.0000	0.0000	0.0000
ToT_E_A_L*Attack_Ty	2.43	0.1069	0.0505	0.0401
Attack_Ty*Valence_S	0.16	0.6947	0.9040	0.9246
ToT_E_A_L*Attack_Ty*Valence_S	1.49	0.2429	0.2009	0.1913
Attack_Ty*Session	0.51	0.4830	0.6158	0.6439
ToT_E_A_L*Attack_Ty*Session	0.80	0.4611	0.5384	0.5545
Attack_Ty*Valence_S*Session	3.14	0.0878	M	M
ToT_E_A_L*Attack_Ty*Valence_S*Session	2.04	0.1502	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
ToT_E_A_L*subject_n*Attack_Ty	0.3333	0.7501	0.8823	0.42135	22.23	5	0.0005
ToT_E_A_L*subject_n*Attack_Ty*Valence_S	0.3333	0.8738	1.0000	0.80788	5.49	5	0.3593
ToT_E_A_L*subject_n*Attack_Ty*Session	0.3333	0.7048	0.8228	0.55731	15.04	5	0.0102
ToT_E_A_L*subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

Box's Test for Equality of Covariance Matrices

Source	Box's M	F	DF1	DF2	P(F)	Chi Sq	DF	P(Chi Sq)
ToT_E_A_L*subject_n*Attack_Ty	55.43	2.16	20	2617	0.0020	43.66	20	0.0017
ToT_E_A_L*subject_n*Attack_Ty*Valence_S	M							
ToT_E_A_L*subject_n*Attack_Ty*Session	M							
ToT_E_A_L*subject_n*Attack_Ty*Valence_S*Session	M							

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Repeated Measures AOV Table for REL_SCORE

Source	DF	SS	MS	F	P
P_Scor_L (A)	2	1.412E+09	7.061E+08	1.70	0.2077
subject_n (B)					
Error A*B	21	8.746E+09	4.165E+08		
Attack_Ty (C)	3	4.995E+10	1.665E+10	62.20	0.0000
A*C	6	4.984E+09	8.307E+08	3.10	0.0100
Error A*B*C	63	1.686E+10	2.677E+08		
Valence_S (D)	1	8.558E+08	8.558E+08	4.36	0.0492
A*D	2	7.274E+07	3.637E+07	0.19	0.8322
Error A*B*D	21	4.122E+09	1.963E+08		
Session (E)	1	4.657E+09	4.657E+09	18.39	0.0003
A*E	2	5405356	2702678	0.01	0.9894
Error A*B*E	21	5.319E+09	2.533E+08		
C*D	3	3.174E+08	1.058E+08	0.54	0.6582
A*C*D	6	1.378E+09	2.297E+08	1.17	0.3349

Error A*B*C*D	63	1.239E+10	1.967E+08		
C*E	3	4.996E+08	1.665E+08	0.64	0.5912
A*C*E	6	4.283E+09	7.138E+08	2.75	0.0195
Error A*B*C*E	63	1.636E+10	2.597E+08		
D*E	1	1.748E+09	1.748E+09	7.40	0.0128
A*D*E	2	3.110E+08	1.555E+08	0.66	0.5279
Error A*B*D*E	21	4.959E+09	2.361E+08		
C*D*E	3	1.786E+09	5.953E+08	4.89	0.0041
A*C*D*E	6	1.463E+09	2.438E+08	2.00	0.0786
Error A*B*C*D*E	63	7.675E+09	1.218E+08		
Total	383				

Note: SS are marginal (type III) sums of squares

Grand Mean	-8467.4
CV(P_Scor_L*subject_n)	-241.02
CV(P_Scor_L*subject_n*Attack_Ty)	-193.22
CV(P_Scor_L*subject_n*Valence_S)	-165.45
CV(P_Scor_L*subject_n*Session)	-187.95
CV(P_Scor_L*subject_n*Attack_Ty*Valence_S)	-165.65
CV(P_Scor_L*subject_n*Attack_Ty*Session)	-190.31
CV(P_Scor_L*subject_n*Valence_S*Session)	-181.48
CV(P_Scor_L*subject_n*Attack_Ty*Valence_S*Session)	-130.35

WARNING: The total sum of squares is too small to continue.
The dependent variable may be nearly constant.

Greenhouse-Geisser Corrected P-Values for Nonsphericity

Source	F	Minimum Epsilon P	Greenhouse Geisser Epsilon P	Huynh Feldt Epsilon P
Attack_Ty	62.20	0.0000	0.0000	0.0000
P_Scor_L*Attack_Ty	3.10	0.0659	0.0211	0.0133
Attack_Ty*Valence_S	0.54	0.4715	0.6129	0.6499
P_Scor_L*Attack_Ty*Valence_S	1.17	0.3304	0.3381	0.3356
Attack_Ty*Session	0.64	0.4322	0.5494	0.5803
P_Scor_L*Attack_Ty*Session	2.75	0.0870	0.0335	0.0227
Attack_Ty*Valence_S*Session	4.89	0.0383	M	M
P_Scor_L*Attack_Ty*Valence_S*Session	2.00	0.1601	M	M

Sphericity Assumption Tests

Source	Minimum Epsilon	Greenhouse Geisser Epsilon	Huynh Feldt Epsilon	Mauchly's Statistic	Chi Sq	DF	P
P_Scor_L*subject_n*Attack_Ty	0.3333	0.7301	0.8961	0.30486	23.43	5	0.0003
P_Scor_L*subject_n*Attack_Ty*Valence_S	0.3333	0.7702	0.9534	0.65777	8.26	5	0.1424
P_Scor_L*subject_n*Attack_Ty*Session	0.3333	0.7530	0.9288	0.60855	9.80	5	0.0812
P_Scor_L*subject_n*Attack_Ty*Valence_S*Session	0.3333	M	M	M	M	5	M

LIST OF SYMBOLS, ABBREVIATIONS, AND ACRONYMS

AL	Attack Location (None, Tracking, Fuel/Resource Management, Score Display)
BFI	Big Five Inventory
CRT	Choice Reaction Time test
D5-effects	deceive, deny, disrupt, degrade and destroy
ECG	Electrocardiogram
EDA	Electrodermal Activity
EOG	Electrooculogram
EMG	Electromyogram
FFI/PI-R	Five-Factor Inventory/Personality Inventory-Revised
HRV	Heart Rate Variability
IBI	Inter-Beat-Interval
IED	Intra/Extra-Dimensional shift ability test
IPIP	International Personality Item Pool
IRB	Institutional Review Board
MATB	Multi-Attribute Task Battery
NASA	National Aeronautics and Space Agency
NEO	Neuroticism, Extraversion, Openness
PANAS-X	Positive and Negative Affect Schedule - Expanded
PPG	Photoplethysmogram
PTT	Pulse Transit Time
RSP	Respiration Rate
SA	Situational Awareness
SKT	Skin Temperature
SOC	Stockings of Cambridge test
STEM	Situational Test of Emotion Management
TDA	Trait Descriptive Adjectives
TLX	NASA Task Load Index
VV	Video Valence (Positive or Negative)